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THE ACADEMIC CAREER AS AFFECTED BY ADMINISTRATION.[1]

IT is my purpose to discuss, in accordance with the central theme of this conference, the influences exerted upon the academic career by the present administrative conduct of university affairs. Whether or not we are prepared to admit that whatever is best administered is best, it seems both fair and profitable to judge the value of admini-

[1] In view of the appearance in SCIENCE of Professor Cattell's proposals for university organization, I have decided to avail myself of the wider publicity for my own treatment of a related issue. My presentation, in common with that of Mr. Munroe (SCIENCE, December 29, 1905) was read before the Trustees' Conference held at the University of Illinois in October, 1905. My personal judgment endorses the complete reconstructive plan that Professor Cattell proposes; I have, however, confined my constructive suggestions to two urgent but simple measures that may be looked upon as the minimum step in the 'gradual evolution' by which the comprehensive plan is to be established. The public discussion of this problem and the indication of the defective status of university organization and tendencies, are in themselves decided gains in shaping opinion. The danger to the academic career seems to me the most serious menace. Any steps taken for the relief of this situation will most directly further the cultural interests of the nation.

strative provisions by the success with which they further the vital ends to which they are but means. Clearly the administration of a university is no end in itself, but only a subordinate contributory measure for advancing the real interest of the higher education. Boards of trustees, and presidents, and deans, and committees would be only a hindrance and not in the least a help to the cause for which universities exist, if these offices could not justify their existence and the methods of their maintenance by their furtherance of worthy educational ideals. Altogether too long has there prevailed alike an unquestioned assumption that such is the case, and—still more unfortunately—a timid suppression or impatient frowning down of any questioning in regard thereto.

It would be desirable, but may not be practicable, to consider in an historical temper, how American conditions have developed a distinctive scheme of university administration—a system that departs from the models of the old world in a direction peculiarly incompatible with our national ideals and principles. To say that the government of our universities is undemocratic may be no fatal condemnation; but it indicates a singular departure from the spirit that animates many of our formal administrative measures even outside of the political field. The situation, moreover, is the more notable because foreign universities in pronounced aristocratic countries offer the contrast of placing the welfare of the cultural and academic life—the authority as well as the responsibility—upon those whose life-work is bound up with and furthered by such institutions, and of thus adopting for monarchical universities a thoroughly democratic form of government. President Pritchett's review of this and allied situations[2] may be cordially commended. He does not hesitate to say that our autocratic methods of university management would be nothing less than intolerable to the German scholar, while emphasizing that the German method is precisely what the spirit of our institutions would presumably favor. This inconsistency of university government with the national ideals which university teaching is called upon to foster is certainly significant.

It needs no discernment to discover that the actual and authoritative government of our colleges and universities does not rest with the faculties thereof; it rests with the president and the board of trustees or regents. In spite of the diversity of practise, the distribution of authority has unmistakably emphasized, and increasingly so, the importance of the presidential office and the regulative function of the board, and has given to the faculty a less and less influential voice in the actual direction of affairs, in the initiative of educational expansion and in the shaping and control of the academic career. The central question that can not and should not be longer avoided, but which should be asked in a perfectly amicable, thoroughly helpful, wholly impartial temper, is whether present arrangements are to be approved and gradually improved; or whether they are to be regarded as fundamentally unfortunate, as something of a menace to the security of our educational future. If any profit is to come from the discussion, the same frankness that approaches so serious a question with honest doubt, but without timidity, must be adopted both by those who uphold and by those who oppose the spirit and issues of actual institutions. In this spirit I place myself with those who look with alarm upon the further growth of present-day tendencies, and who believe that both logic and policy point to an administration of university affairs that shall be based upon a different emphasis of

[2] *Atlantic Monthly*, September, 1905.

principles, upon a different administrative temper.

Doubtless many of the conditions, both favorable and unfavorable, have grown up in very indirect connection with any well-matured policy. They have taken shape rather by the stress of circumstance, by provisional expediency, by the necessity of advancing as one could if one were to advance at all; and this fact offers not only a large measure of excuse for existing deficiencies, but also lightens the task of those who question whether future wisdom lies where the prudent compromise of the past has directed. I repeat, then, that the fundamental standard by which administrative means are to be judged is that of meeting the cultural ends for which universities are called into being. And with equal confidence it is urged that those whose training and talents and purposes in life are concerned professionally with these cultural ends are best fitted and most justly entitled to the shaping of the policy and the practical direction of affairs of the institutions whose guidance is an intimate part of their lives. The appeal of these principles to the judgment of those either conversant with or appreciative of matters intellectual, seems to me so overwhelmingly strong, that the mere placing of them in this fundamental formative position is adequate to command general assent.

The practical interests transfer the discussion to the limitations and possible dangers of too formal a following of this doctrine. For above all, the situation is a practical one; here, as elsewhere, a condition confronts us, but also here, as elsewhere, a condition that derives illumination from the application thereto of an appropriate theory. American conditions, as they affect universities, are so complex, so unprecedented and so entirely unprovided for by governmental or other regulations, that we must solve the problems of their maintenance more independently than would be the case in older communities. It has been our national fate to be called upon to feel our way by practical wisdom, often by a hand-to-mouth policy, with justifiable satisfaction at the notable achievements that followed so closely upon the remoteness from opportunity of the pioneer. This intensely practical development found natural expression in assigning the management of academic, as of all other public concerns, particularly as matters of finance, to a non-professional body of citizens; and to this body has been given the largest authority and indirectly a peculiarly formidable control of the entire university interests. That this control has in the past been variously unfortunate is not a point upon which I wish to dwell. Let the past stand as it is, and serve its worthiest purpose in warning against the dangers of the future. The practical issue arises not so much from the constituted authority as from the mode of using it. Here is the nub of the whole matter; and here some measure of human psychology enters.

It seems difficult for our civilization to foster the type of man who has authority, but finds the highest use of this possession in the restraint thereof, holding it in check for an emergency. Why have authority if not to exercise it freely and conspicuously, even to the show of power for the sake of showing power! Other ways may be better; but what we say 'goes,' as the phrase of the street has it. Naturally such an impulse can find consoling excuse for its distrust to yield to others any share of vested authority, can readily overlook that not the statutory provisions, but the spirit in which they are carried out, forms the essence of all that is writ in the laws and the prophets. It is possibly because this quality of human nature—for which the American idiom has evolved the term 'boss'—is less pronounced in the academic man than in

almost any other, that he finds it difficult to realize how vitally it affects the motives and actions of men devoted to other affairs. I confess that I found incomprehensible the declaration of one whose character commands my admiration, that he would far prefer to be mayor of Chicago than President of the United States; and for no other reason than that the exercise of the personal power of which the former officer disposes, would furnish him with the keenest satisfaction, with the most deeply felt tribute to his own success. That such type of man possesses many qualities of great value must be admitted; but such qualities are in no situation less appropriate than in the governing boards of universities. There, if anywhere, is needed one who finds within him no impulse to use power wantonly, no tendency to control where cooperation alone is desired, to interpret his office in any other spirit than of determining, with generous confidence in expert opinion, what ends are most to be desired, and of using his practical wisdom in aiding the purposes of the common cause. As the national experiments in benevolent assimilation have been more notable for the success of the latter than of the former quality, so has the trustees' interpretation of cooperative control emphasized the latter to the disparagement of the former element. That the correction for this tendency lies neither in the abolition of boards of trustees, nor necessarily in their reconstruction, but only in the transformation of the policy by which the division of authority between them and the faculty shall be regulated, will appear in due course.

Let us remain a moment longer with the bare description of things as they are.[3] The *status quo*, summarily exhibited, recites that the board and the president dispose of many, most or all of the measures that affect in any decisive manner the growth and official welfare of the university, and that affect the personal and professional welfare of the professor. The board in framing its edicts looks to the president as the source of initiative; sets great store by the president's approval; follows his lead in determining academic sentiment or university needs; awards medals of gold or silver or bronze, or dismisses with honorable mention or without it, in accordance with his verdicts; decides what shall be done first and what last and what not at all, largely according to his judgment or preferences. In all this it depends, as a rule, wholly upon the temperament of the president whether he consults or does not consult faculty opinion. His measures may, and most of them do, go directly to the board; they are announced

[3] I must here intrude a word of explanation. My task requires that I speak frankly of existing conditions; and were any one disposed to misinterpret the spirit in which that is done, personal considerations and the reference to particular men or institutions might be read into a discussion in which they have no place. I shall offer no affront to any who may be interested in what I have to say by implying any such misconstruction. The discussion will be maintained upon a wholly objective basis. As is regarded as proper in speaking of the dead, I shall refer to no particular institution except to praise it. Yet I would not have it said that I am speaking of imaginary or exaggerated conditions, not of real ones. I have constantly in mind actual conditions in definite institutions; I find it necessary to exercise caution not to refer to them so definitely that their identity will be surmised. A deliberately cultivated acquaintance with many members of many faculties, a considerable range of earnest and confidential discussion of actual conditions are the basis of my observation. My observations may be faulty; but they are free, they are honestly acquired and have been slowly matured. Some may be inclined to consider the conditions overdrawn, because they have in mind the few most exceptional universities in which the spirit of administration is far more favorable than I picture it. It is the average, not the exceptionally best, that counts in this discussion; and it is the average to which I address myself.

by the president to the faculty as final decisions; and the faculty is called upon to carry out the decision in reaching which they have had no part. Officially and authoritatively, the faculty enjoys—as one is said to enjoy bad health—painfully restricted rights. Its members naturally make their influence felt through unofficial, mainly individual, prestige. Yet in many academic autocracies, the president would look askance upon the direct conference of a member of the faculty with a member of the board, especially to urge views opposed to his own. This is the situation stated in its mildest, most objective terms. Introduce a tactful, sympathetic personality, and the even tenor of academic life is likely to proceed with reasonable serenity. Many colleges—particularly the smaller ones, with simpler problems, more unified interests—will be happily governed by any system and under such leadership as they are likely to accept. But surround the situation with the actual complexities of a great and expanding university, and inject into this relation what the gods occasionally or oftener give unto masterful men—personal ambition, a secretive habit of mind, a protective insensibility, a pseudo-diplomatic behavior, and the love of power that seems to come with the executive title—and you have a situation that may vary from the ridiculously irritating to the sublimely intolerable.

I am tempted to refer, though maintaining the incognito, to a recent experience. A member of a faculty propounded to me the attitude of its president as a psychological problem. I was unable to give any enlightenment, but this is the enlightenment that I received, the result of a careful inductive study. (1) Whenever President X. announced to his surprised faculty that the *board* had adopted such and such a measure, it proved to mean that the president had proposed the measure to the wholly innocent board, and that it was a measure that the faculty, were it given a chance, would have cordially opposed. (2) When a measure was 'up' before the faculty, and opposition unexpectedly developed, an announcement was made by President X. that there were reasons, which unfortunately he could not disclose, that really made the measure necessary, and this meant that if not approved by the faculty, the board would take the proposed step anyway. There were two other types of situations that entered into this psychological analysis; but they are too individual to make it proper to cite them.

The academic comment that occasionally reaches the college president's ears to the effect that his troubles are largely of his own making is intended to remind him that he encourages, or complacently accepts, does not, at all events, protest against and strive for the abolition of the conditions out of which troubles naturally grow. When the presidential policy, or better, the university policy, shall favor the settlement of intrinsically educational questions by the faculty and not for the faculty, the president's lot will be a happier one. The principle that the essential questions, the critically formative and expanding measures, the issues that make or mar the academic career, shall be shaped by faculty consideration, equally demands that they shall not be authoritatively or virtually disposed either by the board or by the president. As to the actual business of the faculty: it is a rather dreary tale. Details, routine, student affairs, occasionally a real issue that somehow reaches that body, but in regard to which they can act only conditionally, not authoritatively; such is the situation that naturally encourages inconsequential talk, inefficient deliberation, restrained initiative. It is nothing short of absurd to withdraw from

faculty discussion all the real educational issues, and expect a company of scholarly men to grow enthusiastic over the privilege of wearily debating how a sophomoric attempt to vault over or climb around the regulations shall be thwarted, or whether the mandolin club both played and behaved so badly upon its last venture that its leading strings should profitably be shortened. One can comfortably resign oneself to picking the bones when one has dined off the fowl, but to have the bird presented after it has been shorn of its attractions at the first table makes a sorry feast.

At this stage we must examine with the practical purpose of this discussion, the types of questions and interests that require consideration in university affairs. There is first the appointment of the instructional staff. In this respect enlightened opinion has accomplished a notable success. In the best type of universities, those most closely concerned have adequate means of making their opinion effective; the president and the board take those executive and formal steps that lead to the election of the candidate and adjudicate where some final authority must assume responsibility. Where this is not the case, the tendency is at least favorable to such a consummation; though abuses of privilege are by no means obsolete. Yet the fact that this phase of the situation has approached a most commendable status should be as frankly emphasized as other less satisfactory phases should be frankly condemned. In principle many prefer the practise of Yale University, in which such nominations are presented for the approval of the faculty. With the proper spirit the essential ends are accomplished by either procedure.

When we come, secondly, to the matter of promotions and salaries, the situation acquires a somber cast. In some few institutions the methods, though not perfectly so, are commendable, in many others moderately perverse, in the rest intolerable. Merely because that is another story, yet a closely related one, do I reluctantly pass by the burning question of the inadequacy of professors' incomes. I content myself with the expression that were those salaries as nearly adequate as they could readily become were sentiment properly effective, certain of the administrative problems would find readier solution; yet in saying this I wish also to emphasize the converse: that were our administrative provisions more suitable, the professor's financial status would have been far more favorable than it now is—and of this more anon. That there obtain widely different opinions as to what a professor should be paid is inevitable; that there should prevail such general misconception as to what influences should determine his compensation, is not inevitable, only unfortunate. This text, also, I must not allow myself to elaborate, though there is strong temptation to do so.

As an administrative policy, the salary problems should be and in large measure can be solved by preventing them from arising. Policy is here all important. With many others, I hold as desirable above all other arrangements, an effective provision that shall pledge a definite and dependable living for worthy service. This would go far towards avoiding the constant and irritating perplexities that from time to time, and in some institutions at the close of each academic year, present themselves with threatening features to be somehow appeased. A system of this general type is well established at Harvard University. What I emphasize as essential therein is that men are elected to positions of definite rank, for definite periods, with definite understandings. The central issue that is to be determined at the close of the period is whether the university desires to retain the services of the occupant; if so,

he steps to the next grade with constantly increasing salary. A normal line of advancement is thus provided. More rapid promotion is always open to promptly established worth and efficiency, and should indeed be the rule, not the exception. Such measure of elasticity the system designedly retains. There is always opportunity for any one to present such considerations as may be proper, and to reenforce them by such arguments as may be suitable, to urge promotion at such time and in such degree as the circumstances warrant. Speaking generally: for all whose fitness for the academic life has been established, the question of salary is as nearly as possible disposed of and advancement is secure. Such a system represents about as practicable a compromise between ideal and available measures as present circumstances permit. It has at all events the supreme advantage of minimizing, and in a fortunate environment, of avoiding wholly the endless disaffections and positive injuries that are inevitable when such matters depend wholly upon the decision of one or two men, whose natural inclination under present circumstances is only too likely to regard the salary item in the budget as the one that admittedly should be first, but is likely to come last. The administrative feeling creeps in or is openly defended, that so long as places can be filled, salaries are not the first consideration. It is this phase of the president's activity that estranges him from colleagueship with his faculty.

How far down in the academic scale this system is applicable can not be determined offhand. Yet in the spirit of an institution in which such a system is liberally administered, it should be easy to place the greatest emphasis upon offering to the men of promise in the oncoming generation the utmost encouragement to rise rapidly in their profession; and to do this as is done in all learned professions, by the judgment of their peers with reference to true academic standards. The point is important as indicating how one set of administrative measures largely avoids difficult and undesirable situations, that another deliberately invites. It is important that a living within the academic fold should not be regarded as a reward to be given to the exceptionally deserving, when circumstances indicate that the only method of retaining their services is to yield what for years has been unwisely and unjustly withheld; but is to be regarded as a natural privilege for all worthy of the academic life. There is not the slightest discrepancy in the inevitable fact that *A* and *B*, men of quite unequal merit and value to their institutions, should be enjoying the same incomes. There is nothing in the slightest degree disconcerting in so inevitable a consequence of human variability; and in a less commercially minded community, no one would think of remarking upon so obvious a situation. A man's academic worth should not and can not in the least be measured by his salary; and any attempt to do so is a deep injury to the profession. If some one has made a mistake in judgment in asking the wrong man to fill a chair, when better men were available, and if the mistake can not be remedied without repudiating obligations already incurred, it is far better to seek any solution of the situation than the one that sets the emphasis upon the very point that has no place in the academic life. Endowed professorships ensuring adequate livings are for this reason a far more ideal system than American circumstances make practicable.

I have thus dwelt upon the more serious of the unfortunate consequences of the dominant systemless practises in American institutions and of the possibilities of their correction. It is even more than a misfortune; it is indeed an indignity that a

scholar of tried worth and reputation—one who in another country would be an *homme arrivé,* with a secure living—should still find the very wherewithal of his sustenance, and the appraisal of his rank meted out to him by the uncertain esteem of one or two of his colleagues—for such the president and dean are—placed in a position of authority by reason of qualities unrelated to any such Jupiterian function. His helplessness in a situation for which inadequate administration or administrative autocracy has left no place for remedy, hardly even for protest, may well invite despair.

The disastrous consequences of this unfortunate situation appear most notably in the discordant notes that break into what remains of the cherished harmony of the academic spirit; and it appears in the loss of appeal of the academic career to those best fitted by endowments and interest to enter its ranks. The drift within the university is towards winning those marks of success upon which administrative dominance sets greatest store. Colleges engage in what the press is pleased to call a friendly rivalry to secure the largest crop of freshmen; and undue influences are set at work upon departments and professors to attract large classes. Facilitation of administrative measures and some practical executive efficiency are more apt to meet with tangible rewards than are more academic talents. It takes a sturdy determination, a sterling character and a large measure of actual sacrifice to withstand this manifold pressure. Those who resist it least, or are least sensitive to anything to be resisted, are likely to find themselves in the more prominent places; and so the unfortunate emphasis gathers strength by its own headway. The spirit of academic intercourse, the influence of individual character, the stamp of the dominant occupation, subtly yet inevitably lose their finer qualities. There comes to be developed a type of academician (*sit venia verbo*) who pursues his career in a decidedly 'business' frame of mind. At the worst, he degenerates into a professorial *commis,* keen for the main chance, ready to advertise his wares and advance his trade, eager for new markets, a devotee to statistically measured success. At the best, he loses with advancing years that mellow ripening of the scholar, lays aside all too willingly the protecting ægis of his ideals and his enthusiasm, and fails to maintain in his activity the very vital quality that appreciative students should, and commonly do look upon, and look back upon, as the choicest advantage of their academic intercourse.

If any one consequence of this serious situation may be rated more serious than the rest, it is the effect of it all upon the younger members of the instructional staff during the most valued portions of their lives. A Teutonic student of our educational situation recently pointed out to me this disastrous phase of our unadjusted university arrangements as the most potent reason for our unproductiveness in original effort, and as the chief obstacle to our cultural advance. He contrasted the situation with that of the *Privat-docent,* who, though with most precarious income, found no hindrance, when once launched upon academic seas, to shaping his career according to his talents, in steering for such ports and by such routes as his survey of the chart directed. That intense and crippling sense of accountability—to which President Pritchett has likewise directed attention—is all but absent from the *Privat-docent's* career, as it is likely to crowd out by its insistent demands almost every other serious purpose of the young instructor. Confessedly the advantages are not all on one side; but the unnecessary hazards placed in the way of the academic aspirant among us, make

the academic career partake altogether too largely of the nature of an obstacle race.

I am aware that the objection may arise to the sombre tones of my pattette, that will protest that such a delineation is the natural result of viewing things through a murky atmosphere or through congenitally disposed obliquity of vision. The delusion is, however, a rather general one; the difficulty is only that it does not find public expression. It is in the confidential talk with others of kindred spirit and experience that a man's real opinions come to the fore. The front that he shows to the world —and that without any fair charge of hypocrisy—is wholly different from his private opinion for home consumption only. I have in mind a professor of national reputation, with a quarter century of successful experience in distinguished institutions of the land, with many honors to his name, and with many public addresses to his credit extolling the successes of American education. This scholar had no hesitation in admitting to me confidentially, that in any true sense, we had no universities in this country, and certainly no academic life; and that in his own career a larger measure of his success than he cared to reflect upon, was probably due to his yielding to influences that his ideals condemned. With not the slightest breach of honesty in his purpose as conceived by approved standards, but with the inevitable compromise to practical necessities, his career had deviated from what under more favorable conditions it might well have been. Such a man is not to be censured; he is the victim of an unfortunate situation; and it is only because such situations may in large measure be relieved by a proper administrative temper, that it becomes proper to cite the instance in this connection.

It is well to return to the practical aspect of the situation. What the average university presents in lieu of an academic provision is little more than a corporation of an industrial type, in which groups of men have been engaged to perform given tasks. The tasks are often liberally conceived, and personal worth properly regarded. Yet the temper is such that commercial considerations enter; and the tendency is rarely absent that makes the first duty of the management, that of securing the work done upon the most economical basis possible. The irrelevancy of this attitude is too complex a tale to attempt to disentangle here. Ideals and policy must come first; and practise can only be worthy when the motive force of such ideals can find expression. With the absence of the weakness of worthy ideals, lower ideals inevitably enter. In the present consideration it may be emphasized that a university can be built up about a group of professorships and about nothing else. Academic benefactors will not have accomplished their highest degree of efficiency, until they recognize in such endowments the most intrinsically valuable form of aiding universities. Whatever hastens the day of liberally provided professorships will ennoble and simplify the administrative problems of universities.

A further class of administrative measures relates to the direction of university growth, the nature of its extensions, the distinctive character of its purposes, its mode of meeting public needs. These questions are far more pressing in so rapidly developing a community as ours, than they are in older civilizations in which the purposes of university activity have become fixed by convention. It is in regard to this set of measures that the initiative is so commonly taken by the president alone; and it is precisely with regard to these that the principles to which I adhere, favor and demand a vital and authoritative consideration on the part of the faculty. It is because a portion of these measures must be determined by the provisions of the budget,

that to some extent the budget itself must be included in this group. As it is, faculty opinion has in most institutions no opportunity to express itself in regard to that which concerns the faculty most intimately. Upon this aspect of the matter I have touched in the general statement.

There is finally a group of minor administrative details, also involving financial matters, which intimately concern the academic activities. I refer to such matters as modes of conducting laboratories, of securing material and all the inevitable business of handling apparatus, and the housekeeping side of instructional and investigative work. This is clearly partly a business matter, and as such belongs to the board, but likewise is it in equal part a matter that affects the efficiency of the laboratory and its work. The contention thus seems just that some mode of administration shall be devised which shall be as satisfactory to the director of the laboratory in the matter of meeting his needs, as it shall be to the administration as business procedure. This, as many another question, is one that concerns jointly these two cooperating parts of university administration; and can be met only by joint consideration.

And now let us bring these various considerations into mutual relation. The system that so generally prevails and whose deficiencies detract from the value of the academic career may be called 'government by imposition.' Possibly this is a harsh word; but to the professor who is obliged to pursue his calling under it, the measures which it enforces are often harsh measures. The system which is advocated to replace it may in like brevity be termed 'government by cooperation,' with the explicit interpretation that the government is by the faculty and the cooperation the function of the administrative officers, including the president and the board. The management of the university's material affairs advantageously falls to the board; and what shall be included under this head is not likely to be a serious point of contention, if once it be admitted that many material provisions directly influence the work of the faculty, and that for such the faculty shall have a voice in determining how these material affairs shall be administered. Assent must be gained for the view that the faculty is quite capable of determining whether the needs of the institution make it preferable to administer certain details themselves or have them otherwise regulated. So long as measures are not imposed, but are the issue of deliberation of both bodies acting cooperatively, concord and progress are assured. For the most part the material administration may well remain where it now is placed; but the right of discussion, of opinion and of protest should be freely exercised. Even with similar measures, the spirit of the administration and the dignity and security of the academic career, would be wholly different under the two systems.

To what measure the present system of administration is due to the irrelevant transfer of methods suited to a business corporation, to institutions flourishing under conditions of wholly opposed character, I can not stop to discuss. Many critics find in this perverse application of glorified business procedure the source of academic inadequacy; others count it as but one of several influences, and not the chief. What is unmistakable is the pernicious dominance of the business spirit both in the administration and in the academic interests. I prefer to speak of the internal influences as more closely allied to my thesis. There is at work among American universities a spirit of intense rivalry, a desire for each to measure its own work by standards of tangible material success. College presidents like to be remembered by the buildings which were erected through their initiative, by the departments which have been

added, and the enrollment which has been increased. It is by urging these needs and presenting these successes that funds are secured. If such were really the standard by which educational ends are to be appraised, then the business methods might well be adapted to university affairs. It is against this false standard that the warfare must be actively directed. It would undoubtedly be the most beneficial fate that could happen to many of our universities to-day, if for a considerable period they built no new buildings, added no new departments, found their enrollment gradually decreasing and centered all their energies upon the internal elevation of true university ends, upon providing, for student and professor alike, the intellectual environment in which those interests thrive, for which student and professor come together, by which the academic ideal is inspired.

The same spirit is felt throughout every detail of university life, from athletics up or down as our standards may be. It tempts the professor to spend his energies in securing large classes; it sets departments to devising means to outrank in numbers the devotees of other departments; it makes the student feel that he is conferring a favor upon the university by coming, and then upon the professor, by choosing his classes; it leads the administration to value the professor's services by his talents in these directions, to appraise executive work, at least financially, far more highly than professorial service; and, worst of all, it contaminates the academic atmosphere so that all life and inspiration go out of it, or would, if the professor's ideals did not serve as a protecting ægis to resist, often with much personal sacrifice, these untoward influences.

In bringing these considerations to a close, I must first defend my position against certain objections that are apparent, and then focus the discussion upon the remedial aspect of the situation. I am confident that I do not undervalue the services that have been done for American education by the very types of administration against which I protest. A strong case may be made out for the opinion that for the work that had to be done and the conditions that obtained, it was the only method available and a good one. My face is turned to the future; and the recognition of past achievement and fitness is no token of increasing service under more developed conditions. The general advantages of the presidential form of government are equally obvious. The cause and the strength, I can not bring myself to say the justification, of the conditions which with so many others I deplore, are not far to seek. Those who defend present academic arrangements bring forward pertinent considerations, to which any one approaching the issues in a practical temper will give due weight. The advantages of centralized power will not lightly be set aside; nor is there any reason for losing the most essential of them in such reconstruction as is needed to rehabilitate the academic career. We need not repeat the common educational mistake, so neatly pictured in the German phrase, of tumbling out the child with the bath. Wisdom as well as sanity is the name for a certain perspective of values. In company with those who share the attitude of my protest, I am keenly sensitive to the obligations that our educational welfare has incurred to the very offices whose policy and activity I cite as but slightly commendable. I am calling attention to the fact that these pearls of price will have been too dearly bought, if they lead to the deterioration of the academic career through loss of dignity and attractiveness to those to whom they should make the worthiest appeal. The very qualities upon which emphasis is laid bring types of

men into high office and into the academic chairs who have not within them the possibilities that contribute to the inspiration of the institution of which they become an organic part. Confining the issue to the administrative aspect only, I am content to repeat the comment of one of the speakers of this conference, whose point of view is hardly likely to be regarded as prejudiced. He tells us that 'Young men of power and ambition scorn what should be reckoned the noblest of professions, not because that profession condemns them to poverty, but because it dooms them to a sort of servitude.' And as a forecast of the future in the light of the present, this:

> Unless American college teachers can be assured . . . that they are no longer to be looked upon as mere employees paid to do the bidding of men who, however courteous or however eminent, have not the faculty's professional knowledge of the complicated problems of education, our universities will suffer increasingly from a dearth of strong men, and teaching will remain outside the pale of the really learned professions. . . . The problem is not one of wages; for no university can become rich enough to buy the independence of any man who is really worth purchasing.

A situation that calls forth such earnest, disinterested protest can not but be somber in tone. Yet I am anxious to reveal the touch of optimism that makes the world akin, and record that the brighter colors have as legitimate a place in academic portraiture as my enforced selection for this occasion of the neutral and the darker grays. The compensations of the academic life are real enough: they simply form, like much else that I have omitted, another story. I should be sorry to have it inferred that a happy academician must be sought by the despairing light of a Diogenes lantern; though I have implied that in one's less hopeful moods, the lamp of learning seems a precarious illumination amid the blinding incandescence of the rival interests of our intensely modern life. The devotion to the purer, more sensitive flame is in fact endangered; and those whose responsibility and consolation it is to hand it on to others with undiminished ardor, have cause to feel that their vocation is shorn of favoring fortune, is beset by lack of power to order their lives by appropriate standards, is embarrassed by needless and remediable adversities.

I must also forestall the deduction, which would be quite wide of my purpose, that I am in any sense advocating the abolition of presidencies and boards, and am proposing measures far too radical to be practicable. On the contrary, I concede that the present mode of administration, if it can be freed, as there is good reason to believe it can, from the spirit of its practise that now seems dominant, is a very efficient and commendable method of accomplishing a purpose which from the outset has been set forth as a subsidiary means to an end. If it furthers that end, it would in my judgment hardly be worth while to change it, even if that were readily possible. If the present *spirit* of administration is the inevitable result of the present *method,* then the method can not be commended, however modified. Here the ways divide; and the judgment of expediency has a more commanding voice, which it should not raise, however, in defiance of principle.

It would be possible to frame an academic decalogue, the obedience to which, though it would not ensure the realization of all ideals, would guard against the more obvious transgressions. I shall content myself with suggesting but two of the provisions. The first is the introduction of a definite system of salaries with such liberality as may be possible, that provides for promotions and increases, and establishes the academic applicant upon a definite footing. This measure is not proposed as a panacea, and can at best be but negatively

effective. Yet it has great positive value under present circumstances, for the reason that only when this phase of the matter is disposed of, is it possible satisfactorily to consider other weighty issues. It is most unfortunate that this financial aspect must be placed so prominently in present discussions; for such prominence but enforces the inadequacy of the academic situation. It would, however, be foolish to disregard this irritating stumbling-block, which must be removed if academic freedom is to be maintained. The professor desires money in order that money considerations may not enter disturbingly into his life; and universities should once for all determine matters of salary, in order that their energies may be more profitably expended.

The second provision is that no measure shall be decided by the president or the board without giving the faculty an opportunity to decide whether it cares to express itself upon that measure or not. Such provision inevitably carries with it the right to have a share in deciding in the first place what division of questions shall be made between faculty and board. To accomplish this end, an advisory committee of the faculty seems an efficient means. Such committee should decide in each case whether and how far questions should be considered by the faculty; and naturally the president, as a member of such a committee, will bring before it first and for approval all measures that he regards as worthy of the attention of the board. An arrangement of this type is in force in Leland Stanford University. With slight change in the apportionment of the present authority, such a measure will be adequate to bring to the faculty a voice on all questions upon which, in its own judgment, its expression of opinion would be for the best interests of the university. Such committee would attend the meetings of the board and participate in its discussions, though without right of vote. The president would serve as the formal spokesman of the faculty influence, and could then be, what it should be his highest ambition to be, the leader, not the governor of the faculty, and a defender of the academic life.

I have no desire to lay minute stress upon particular remedies, which must always take their shape from local conditions, though in still larger measure must they be framed by ideals and purposes, that are much the same wherever the academic spirit is cherished. I desire only to remove the objection that practical measures to remove difficulties can not be readily devised. I know very well that changes of ideals and purposes must first inspire confidence and enthusiasm before they reach practical possibilities; but I am encouraged by the example of so many other educational and national evils, that, once clearly recognized, have in astonishingly brief time been swept away by the strenuous purpose of the national temper. It is in such a movement that the present discussion would find the most desirable consummation.

I am fully aware that no such administrative reform is to be looked for until the ambitions that universities and particularly their presidents cherish, are considerably altered. When internal cultural measures are acknowledged to be the leading issues of the academic life, it will fall more and more to the faculty to carry them out; there will be less and less need of the present type of president, less temptation to develop the office primarily for those functions which it now serves. The type of individual that will then be sought for the position will be selected by a different perspective of considerations; and the academic career will have greater promise of reaching a worthier status than it now

occupies. First as last, it is directly through ideals and indirectly through administrative provisions that further ideals, that the welfare of academic concerns is determined.

JOSEPH JASTROW.

UNIVERSITY OF WISCONSIN.

SCIENTIFIC BOOKS.

Elements of Mechanics; Forty Lessons for Beginners in Engineering. By MANSFIELD MERRIMAN, Professor of Civil Engineering in Lehigh University. New York, John Wiley and Sons. 1905.

Elements of the Kinematics of a Point and the Rational Mechanics of a Particle. By G. O. JAMES, Ph.D., Instructor in Mathematics and Astronomy, Washington University.

Professor Merriman believes that "there should be given in every engineering college two courses in rational mechanics, an elementary one during the freshman year in which only as much mathematics is employed as is indispensably necessary, and an advanced one after the completion of the course in calculus." The forty lessons contained in this book on the 'Elements of Mechanics' are intended to cover the suggested elementary course. Its seven chapters are entitled Concurrent Forces, Parallel Forces, Center of Gravity, Resistance and Work, Simple Machines, Gravitation and Motion, Inertia and Rotation. The treatment of these topics is characterized by the simplicity of statement and illustration which are familiar to users of the author's numerous other text-books for students of engineering. His aim seems to be to give the student working rules in the quickest and most direct manner, and to this end strict logical rigor and accuracy of definition and statement are sometimes sacrificed.

There is no formal statement of the laws of motion in their ordinary form, but ten 'axioms' are given which presumably are designed to appeal more directly to the experience of the beginner. It is to be feared that certain of these are stated with too little care as regards accuracy (for example, 'when only one force acts upon a body it moves in a straight line in the direction of that force'), and that others will be found too vague to be of much service. This vagueness is due in part to the failure to give definiteness to the conception of force. No student can think clearly and correctly about force until he has grasped the elementary notion that every force is exerted *by* one body or portion of matter *upon* another, and that a force exerted by A upon B is always accompanied by an equal and opposite force exerted by B upon A, the two forces constituting the action and reaction of Newton's third law. This fundamental principle is not expressed nor even implied in the ten axioms given in this book; on the contrary, the author's explanation of his third axiom involves a wholly erroneous statement of the law of action and reaction.

It is, however, to the practically minded student rather than to the stickler for logical rigor that Professor Merriman addresses himself primarily, and from his point of view such defects as are here criticized are of minor importance in comparison with simplicity and directness in the presentation of working rules. With this point of view many teachers of mathematical subjects to students of engineering will largely sympathize, and they will find in this book the merits which are conspicuous in the author's previous text-books. Not the least of these merits is the large number of examples, mostly numerical, to be solved by the student.

The book of Dr. James is designed as an introductory course in rational mechanics, but it is addressed not to students of engineering but to those whose interest is in pure science. It contains little of application, but aims at a rigorous and thoroughly sound formulation of fundamental principles.

The treatment of kinematics, which occupies Part I., is clear and concise throughout. This conciseness is aided by the free use of the notions and language of vectors, especially the notion of the geometric time-derivative in the treatment of curvilinear motion. The use of the term displacement to designate the position-vector of a moving particle seems, however, singularly inappropriate.

The opening chapter of Part II. gives the author's formulation of the axioms or fundamental principles of mechanics. His point of view here is that of those critics who reject force as a physical reality and state the fundamental laws simply in terms of acceleration. The term force is afterward introduced and defined as a convenient name for the product of mass into acceleration. In the statement and explanation of the second of the three 'principles' the term 'field of force' is, however, used in advance of the formal definition of force.

The three 'principles of mechanics' are stated as follows:

An isolated particle has no acceleration with respect to the absolute axes.

The acceleration which a particle takes in a resultant field of force is the geometric sum of the accelerations produced by the component fields, and is independent of the particle and of its motion.

Two isolated particles under their mutual actions take accelerations in opposite directions along the line joining them, and these accelerations are in a constant ratio.

Regarding this formulation and the accompanying explanations two matters invite comment. The first is the definition of the absolute axes, the second the explanation of the meaning of 'component fields' in the second principle.

The notion of the fixed axes is first introduced at p. 23:

But while, in kinematics, the choice of the *absolutely fixed system* is perfectly *arbitrary*, it is *no longer so in mechanics*, and there we shall see that the fixed stars *must* be chosen as the system of reference.

Again on p. 104:

In kinematics the choice of the absolute axes was arbitrary. The state of affairs in mechanics is different. The principles just spoken of are asserted true of the motion of a particle referred to a *particular* set of axes *invariably connected with the so-called fixed stars*. These I term the *absolute axes*. Referred to any other set the *principles* must be modified.

This method of defining the absolute axes has been adopted by several critics who are unwilling to accept Newton's doctrine of absolute space and time. To call the axes determined by the fixed stars 'absolutely fixed axes' is, however, to evade rather than to avoid whatever difficulty there is in Newton's conception. From the Newtonian point of view axes thus defined are not really absolutely fixed, but are merely the axes most nearly fixed in direction which it is possible to specify practically. We can not doubt that the stars move relatively to one another, and that the line joining the centers of two stars really changes in direction, although observation does not detect such motions; and we thereby implicitly assume the reality of a more fundamental base of reference than the fixed stars. Whether or not we are willing to adopt Newton's language and speak of absolute space and time, we are driven to substantially his position when we attempt to define the axes of reference for which the fundamental principles of mechanics are true.

The meaning of component and resultant fields in the statement of the second principle is explained substantially as follows: If a system of particles n is made up of systems p and q, the field due to n is the resultant of two component fields, one of which is the field which p would produce if q were absent, the other the field which q would produce if p were absent. The 'principle' affirms that the acceleration of a particle due to n is the geometric sum of the acceleration which p would cause in the absence of q and that which q would produce in the absence of p.

The second principle as thus explained affirms more than should really be included in the law of composition. An accurate formulation of this law involves the law of action and reaction. The essence of the two laws may be stated as follows: Considering any system of particles, the actual acceleration of any one particle due to the influence of all the others may be vectorially resolved into components regarded as 'due to' the several other particles; and these components may always be taken in such a way that the law of action and reaction is satisfied, *i. e.*, that the acceleration of any particle A due to B and the acceleration of B due to A are in the inverse ratio of the masses of A and B and

oppositely directed along the line AB. This is all that the laws of motion imply. They do not imply that the acceleration of A due to B is the same when a third particle C is present as when it is absent, although this implication is often read into them.

The supposition that the mutual action between two particles A and B may depend in part upon the influence of a third particle C has been called the hypothesis of modified action. Pearson,[1] while emphasizing the possibility that such a hypothesis may represent the truth for molecular or ethereal actions if not for actions between particles of gross matter, states that 'one of Newton's laws of motion distinctly excludes this hypothesis.' To thus interpret Newton's laws seems, however, a mistake. The essence of these laws may be summed up in the principles of the constancy of linear and of angular momentum for any isolated system. These principles do not exclude the hypothesis of modified action.

The second principle of Dr. James also goes too far in asserting that the acceleration of a particle in a field of force is 'independent of the particle' (*i. e.*, of its mass). That this is true in a particular case such as that of gravitational fields is a consequence not simply of the laws of motion but of the law of gravitation, and the possibility of cases in which it is not true may be admitted without thereby questioning the universal validity of the Newtonian laws.

The foregoing comments have been made because of the intrinsic interest of the questions raised, rather than from any desire to criticize adversely the presentation of Dr. James, which in the main is admirably clear and logical. The remainder of the book is devoted mainly to a discussion of the direct and inverse problems of the mechanics of a particle—*i. e.*, the determination of the law of force when the motion is known, and the determination of the motion when the law of force and the initial conditions are known. These problems are treated for both the case of fixed axes and that of moving axes. In particular considerable space is given to motion relative to the earth.

[1] 'Grammar of Science,' second edition, p. 319.

On the whole, the book is one that is well worthy the attention of any one who is interested in the rigorous treatment of the fundamental principles and problems of mechanics.

L. M. Hoskins.
Leland Stanford Junior University.

THE OTHER SIDE OF EVOLUTION.[1]

Books are rare which, in their last sentence 'look hopefully to God for that only which will deliver the church from this [evolution] and all other pestilent evils, theoretical and practical,' and I owe, perhaps, an apology to the readers of Science for not sooner calling their attention to 'The Other Side of Evolution.'

The scope of the book is given in the preface:

> It will be shown that evolution is not accepted by all scientists and scholars; that it is rejected by some of the greatest of these; that it is admittedly an unproven theory; that it has never been verified and can not be; that not a single case of evolution has ever been presented, and that there is no known cause by which it could take place. Its arguments will be considered one by one and their fallacy shown. It will be shown to be, by its own principles, unscientific and unphilosophical, and simply a revamping of the old doctrine of chance clothed in scientific terms. Finally, it will be shown that it is violently opposed to the narrative and doctrines of the Bible and destructive of all christian faith; that it originated in heathenism and ends in atheism.

A sharp distinction is not always drawn in this volume between evolution in general and organic evolution, but in the 'Foreword' we are told (p. 2): "The theory of evolution asserts that from a nebulous mass of primeval substance, whose origin it never attempts to account for, there came by natural processes, as a flower from a bud, and fruit from flower, all that we see and know in the heavens above and the earth beneath"; and on page 4: "The theistic and the atheistic evolution, however,

[1] 'The Other Side of Evolution, an Examination of its Evidences,' by Rev. Alexander Patterson, author of, etc., with an introduction by George Frederick Wright, D.D., LL.D., F.G.S.A. The Winona Publishing Co., Chicago, Ills. Winona Lake, Ind.

agree in saying that man was descended from the brute. * * * This doctrine as to man is the vital part of the whole theory and in this all evolutionists are practically agreed." This leaves no doubt as to where the shoe pinches.

However, we are further informed (p. 60) that

> The central point in the whole theory is the descent of man from the brute. It is this which, as stated, gives it importance to the christian. But for this, the hypothesis would be but a curious scientific theory. It is a matter of comparative minor interest how the universe or the various species came.

Chapter I. deals with evolution [organic] as an unproven, unaccepted theory and the Uncertainty of Scientific Theories in General.

Chapter II. deals with: (1) The Origin of Matter; (2) The Origin of Force; (3) The Formation and Orderly Arrangement of the Universe; (4) The Origin of Life.

Both chapters I. and II. are mere skirmish lines; the real attack begins in chapter III., which deals with The Evolution of Species. 'Not a Single Instance of Evolution is Known,' under which caption we have:

> The world has been ransacked for evidence, the museums are full of specimens, the secrets of nature have been explored in every land, the minutest creatures discovered and analyzed. We have the remains of animals and plants of many kinds thousands of years old, such as the mummied remains from Egypt, and yet not a single instance of the change evolution asserts has ever been known!

Other items in this chapter are: 'No Cause of Evolution Known,' 'How Evolution Originated Species.' Under the last head are 'abbreviated, and rendered into untechnical language, the thoughts of evolutionary writers' as follows:

> Eyes originated from some animal having pigment spots or freckles on the sides of its head, which, turned to the sun, agreeably affected the animal so that it acquired the habit of turning that side of the head to the sun, and its posterity inherited the same habit and passed it on to still other generations. The pigment spot acquired sensitiveness by use and in time a nerve developed which was the beginning of the eye.
>
> In a time of drought some water animals, stranded by the receding waters, were obliged thenceforth to adopt land manners and methods of living. Although, strangely, the whale by the same cause was forced to the water, for it was once a land animal, but in a season of drought was obliged to seek the water's edge for the scant remaining herbage, and, finding the water agreeable, remained there and its posterity also, and finally, the teeth and legs no longer needed, became decadent and abortive as we see them now.
>
> The same drought produced another and wonderful change, for it is to this that the giraffe owes his long legs and neck. The herbage on the lower branches withering up, he was obliged to stretch his neck and legs to reach the higher branches. This increased, as all such changes increased, in his posterity, and finally after many generations produced the present immense reaching powers of the giraffe. So that the same drought deprived the whale of his legs and conferred them upon the giraffe.

Still other items in this chapter are the Arguments from Geology, classification, distribution, morphology, embryology and 'Facts Opposing Evolution of Species.' Again, under 'The Argument from Embryology' we have:

> Evolution derives it greatest arguments from the study of the embryo. It makes three claims. First, that the germ of everything, plant and animal, is the same, neither chemical analysis nor the microscope showing any difference.

This is indignantly refuted by:

> Protoplasm, of which the germ is composed, differs and is not homogeneous material. That which builds the muscle is one kind and that which builds brain and nerves is entirely different. * * * Nor could the germs be alike, for the plant breathes carbon, the animal oxygen.

That ought to settle it.

Chapter IV. deals more particularly with the evolution of man. The argument from rudimentary organs is vigorously repudiated:

> Shall we condemn the whole race to a bestial origin on the same evidence? All arguments founded on such facts are weak, puerile and unworthy of scientists. * * * Shall we suspend a philosophy of the universe upon a few long hairs? Shall we allow the guess as to the origin of the tip of the outer ear to revolutionize theology? Shall we risk our eternal destiny on the supposed uselessness of the so-called 'gill-slits' in premature puppies?

The Neanderthal skull "was claimed by the evolutionists as from two to three hundred thousand years old. Dr. Meyer, of Bonn, examined the evidence, and found it to be the skull of a Cossack killed in 1814."

Chapter V. shows Evolution Unscientific and Unphilosophical. Chapter VI. contrasts Evolution and the Bible, and the last chapter, VII., considers The Spiritual Effect of Evolution.

In this last chapter evolution is accused of many misdeeds:

It is, indeed, a fact that many young men have started with high purpose to prepare for the ministry and even for foreign missions, and have, after adopting modern theories, abandoned their purpose. * * * This apparent increase of faith [sometimes brought about by the adoption of evolution] simply prepares the way for its utter ruin. Instead of looking for a regeneration, a revolution of the inner state, the believer in evolution necessarily looks for a change from education or other form of development. It is, therefore, worse than unbelief.[2] It is antagonism. It is enmity! Once committed to this theory, there is no extreme the person may not reach. When openly advocated and taught, it is useless to seek revivals among those so taught.

As a consequence of all this we have the lamentable fact:

Education received in the United States over $200,000,000 in gifts during the last few years, to say nothing of the many-fold more received from incomes and public funds. * * * Whether this is the final form of unbelief is difficult to say. * * * It bears the marks of anti-christianity the apostle speaks of. * * * All satanic methods before this have been crude and coarse compared with this last invention. It is the most subtle and sweeping of all evil methods to ensnare the mind of man.

[2] For the benefit of the Rev. Patterson attention should probably be called to the fact that he is rather hard on St. Augustine and other church fathers who interpreted the story of creation in Genesis to mean the planting of the seed of creation, not the actual special creation of species, rejecting "Special Creation in favor of a doctrine which, without any violence to language, we may call a theory of evolution." Furthermore, that Patterson's method of interpreting the story of creation was introduced into the church by the Spanish Jesuit Saurez near the middle of the 16th century. Fortunately the followers of Suarez who "suspect the study of nature as if God were a hypocrite and did one thing in his work and said another in his Word" are growing fewer in number.

It certainly must be, for it has captured Patterson himself. He is evidently not conscious of the fact, and he would no doubt repudiate the accusation in appropriate English. We will, therefore, permit him to again speak for himself. The italics are mine. Patterson does not realize that the trend of evolution may be downward as well as upward and that specialization frequently goes with the reduction of parts.

(P. 47): Bearing in mind that this conclusion [the descent of Hippus from Eohippus] is pure assumption, and only inference at best, let us remark that it violates the primal law of evolution laid down by Spencer, that of evolution from the simple to the complex. It should have shown first the one-toed horse, then his development into a two-toed animal, and so on up to a horse having five toes. This would be evolution. As it is, we see the opposite of evolution, degradation, *which often occurs in nature* * * *.

This notion that degeneration is not evolution is also brought out in connection with the air-bladder of fishes, and Cope is quoted against evolution: 'The retrogradation in nature is as well or nearly as well established as evolution' and (p. 53):

The wild varieties of plants and animals are far inferior to the cultivated kinds. The older species are far superior to the present. The saber-toothed tiger is far superior to the present animal. * * * Progress is not seen to be upward in the flowers. So also parasitism is degeneration both in plants and animals. (P. 81): The late find of skeletons at Croatia, Austria, is heralded as the discovery of a connecting link. But these are skeletons of men and not of brutes. They are degraded men and *nothing is better known than the possibility of degeneracy in man.* (P. 89): We have seen that modern man has not developed in brain capacity above prehistoric man. It is also true that he has not developed physically. * * * *Indeed, we have degenerated in many respects. We have almost lost the sense of smell as compared with savage peoples or even animals. Our teeth are certainly not improving.* If we are

to find perfect specimens we do not look at the most advanced classes, but to the reverse. Those who live to extreme old age are generally in the lowly ranks. But why has physical development ceased at all? Why are there not some superior beings by this time? But alas, there are no marks or indications of wings or halos on either the great saints or scientists of the day.

Alas, there are not!

CARL H. EIGENMANN.

SOCIETIES AND ACADEMIES.

THE WISCONSIN ACADEMY OF SCIENCES, ARTS AND LETTERS.

THE thirty-fifth annual meeting of the Wisconsin Academy of Sciences, Arts and Letters was held at Madison, February 8 and 9, 1906, the president of the academy, Dr. John J. Davis, presiding. On the evening of February 8 a dinner, complimentary to visiting members, was given, followed by an address by the president on 'The Academy—Its Past and Its Future.' During the four regular sessions the following program was presented:

RICHARD G. NORTON: 'An Investigation into the Cause of the Breaking of Watch Springs in Greater Numbers during the Warm Months of the Year.'

C. S. SLICHTER: 'The Limitations of a General Method of Approximation in Hydrodynamics.'

C. S. SLICHTER: 'A Fundamental Existence Theorem for Linear Homogenous Differential Equations.'

JAMES L. BARTLETT: 'The Climate of Madison.'

A. R. WHITSON: 'The Influence of Soil Temperature on the Occurrence of Frost.'

G. C. COMSTOCK: 'The Luminosity of the Brightest Stars.'

EDWARD T. OWEN: 'Hybrid Parts of Speech.'

NINA M. SHELDON: 'The Supernatural Elements in the English and Scottish Ballads.'

ARTHUR BEATTY: 'English Dramatic Origins—A Protological Study.'

F. C. SHARP: 'A Study of Moral Standards.'

REUBEN G. THWAITES: Memorial Address—'James Davie Butler.'

CHARLES E. BROWN: 'Wisconsin's Quartzite Implements.'

ARTHUR C. BOGGESS: 'The Period of Anarchy in Illinois, 1782–90.'

SOLON J. BUCK: 'The Occupation of Government Land in Oklahoma Territory.'

J. F. DILWORTH: 'Life in the Beguinages before the Reformation.'

E. K. J. H. VOSS: 'A Nuremberg City Ordinance of the Year 1562, Issued during the Time of the Black Death.'

D. L. PATTERSON: 'Alexander and the Council of Worms.'

D. C. MUNRO: 'The Children's Crusade.'

G. C. SELLERY: 'Suspension of *habeas corpus* in the Civil War.'

ULRICH B. PHILLIPS: 'Problems of Colonization as Illustrated in the Province of Georgia.'

C. R. FISH: 'Tables Illustrating the Progress of Rotation in Office.'

WM. V. POOLEY: 'Causes Affecting the Westward Movement of Settlement Prior to 1850.'

W. F. KOELKER: 'Note on the Nature of the Hydrocarbons Occurring in Wisconsin Oil Rock.'

LOUIS KAHLENBERG and ALONZO S. MCDANIEL: 'On the Differences of Potential between Manganese and Lead Peroxides and Various Aqueous and Non-aqueous Solutions.'

L. A. YOUTZ: 'Nitrogen from the Atmosphere and Its Use in the Annealing of Brass Wire.'

V. LENHER: 'Nitroselenic Acid.'

W. D. FROST, R. WHITMAN and R. E. MILTENBERGER: 'Effect of Desiccation on *Bacillus dysenteriæ* Shiga.'

GEORGE WAGNER: 'A Note on the Chemotaxis of *Oxytricha aeruginosa*.'

GEORGE WAGNER: 'Some Points in the Natural History of the Spoon-bill Catfish.'

G. A. TALBERT: 'Variations of the Brachial and Sciatic Plexus of the Frog.'

G. A. TALBERT: 'Cerebral Localization from a Clinical Study.'

C. B. HARDENBERG: 'Comparative Studies on the Trophi of *Scarabæidæ*.'

E. A. BIRGE and V. LENHER: 'The Gases of Wisconsin Lakes.'

E. C. CASE: 'Wave-rolled Snowballs.'

W. S. MILLER: 'The Mesothelium of the Pleural Cavity.'

S. WEIDMAN: 'An Additional Driftless Area in Wisconsin.'

J. J. DAVIS: 'Notes on a Few Parasitic Fungi of the Pacific Northwest.'

R. H. DENNISTON: '*Gasteromycetes* of Wisconsin.'

C. E. ALLEN: 'The Life History of *Coleochæte*.'

GEORGE M. REED: 'Infection Experiments with the Mildew on the Cucurbits.'

R. A. HARPER: 'The Nature of the Variation of the Spore Number in the Ascus.'

W. Marquette: 'Polar Organization in the Cells of *Isoetes*.'

E. W. Olive: 'Cell and Nuclear Division in *Basidiobulus*.'

J. B. Overton: 'On the Permanence of the Chromosomes in the Calla Lily and the Elm.'

A. H. Christman: 'Spore Formation in the Primary Uredo.'

B. M. Allen: 'The Origin of the Sex Cells of *Chrysemys*.'

Hon. John W. Hoyt and C. Dwight Marsh, both of Washington, D. C., were elected delegates to attend the celebration of the two-hundredth anniversary of the birth of Benjamin Franklin at the University of Pennsylvania, April 17–20, 1906, and Dr. Ernest R. Buckley, of Rolla, Mo., was chosen to represent the academy at the dinner commemorating the fiftieth anniversary of the founding of the St. Louis Academy of Science at St. Louis, March 10, 1906.

The following officers were elected by the academy for the ensuing three years:

President—Louis Kahlenberg, Madison.

Vice Presidents—Charles H. Chandler, Ripon; Henry E. Legler, Madison; E. C. Case, Milwaukee.

Secretary—Charles E. Allen, Madison.

Treasurer—Rollin H. Denniston, Madison.

Librarian—Walter M. Smith, Madison.

Curator—Charles E. Brown, Milwaukee.

Publication Committee—The president and the secretary *ex officio*, E. B. Skinner.

Library Committee—The librarian *ex officio*, Herbert J. Farley, George W. Peckham, Hiram D. Densmore, George Wagner.

Committee on Membership—The secretary *ex officio*, R. H. Halsey, Miss Harriet B. Merrill, D. C. Munro, L. A. Youtz.

Charles E. Allen,
Secretary.

The Philosophical Society of Washington.

The 614th meeting was held February 24, 1906.

Professor J. H. Gore gave a new demonstration that o/o is indeterminate, using the formula for the straight line through two points and making the points coincident.

The problem presented at the last meeting by President Abbe regarding the sound from a meteor was called up by Mr. Buckingham, who pointed out that the wavefront is approximately conical and the sound appears to reach the observer from a direction normal to this front. Mr. Nutting showed that with the assumed velocities by Döppler's principle, the intensity of the sound before and after passing the observer would be about 700 to 1.

Mr. E. R. Frisby then spoke on 'The Progress of the Coast Survey Work in the Philippines.' This is carried on at the joint expense of the United States and Insular governments. The problem is unique since there are 3,146 islands in the 115,000 square miles; a third of them have areas of less than one tenth of a square mile. Owing to commercial needs, the astronomical position of a number of points was first determined and then harbor surveys were made, coast survey and triangulation being postponed. Plumb-line deflections are found to follow the topographical indications. The work was done by four or five parties in five ships. The early and smaller charts were printed in Manila.

Mr. F. H. Bigelow then discussed 'The Formation of Cyclones and Anticyclones,' in the light of the information furnished by the European and American kite and balloon ascensions made during the past ten years. A historical summary of early efforts to solve this problem showed that Ferrel's cyclone, as well as the type of vortex employed by Guldberg and Mohn, or Oberbeck, depended upon a symmetrical distribution of the temperature around a central axis. On the other hand, the modern observations show that the temperature distribution is asymmetric, one half of the respective areas being warm and the other half cold. Diagrams of the pressure, temperature and velocity in the several levels from the surface to 10,000 meters give the changes in passing from one level to another, the systems being the same in each hemisphere. Especially the temperature-gradients, or temperature-falls per 1,000 meters, were worked out for the anticyclone and cyclone as a whole, also, in each quadrant of these separately, the result being that there is a wide departure from the adiabatic law, and that there is a remarkable variation in each quadrant.

These must be accounted for in any theoretical solution, and an exhibit was made of certain formulæ which are being tried to account for the observed velocity, pressure, temperature and heat contents in the several levels.

THE 615th meeting was held March 10, 1906.

Mr. H. C. Dickinson discussed 'Thermal After-effects on Thermometer Glass,' describing experiments made at the Bureau of Standards on new unseasoned tubes of Jena glass. At about 400° C. glass is plastic to internal strains while still rigid to external strains. So by prolonged heating at high temperatures the strains are relieved which have been set up on manufacturing the instrument and which cause a rise in the zero-point. The Jena normal thermometer glass, which is easy to work, is used up to 450° C.; the Jena borosilicon glass, which is very difficult to work, is used up to 550° with an internal pressure of twenty atmospheres. The results were shown by lantern slides of curves that indicated the change of zero as a function of the temperature of annealing and the duration of exposure at this temperature. The exposures were made in an electric furnace in which the temperature was kept quite constant for many days.

Mr. R. A. Harris presented a paper entitled 'On Function-Theory Analogues Relating Chiefly to Mathematical Physics.' The chief object of the communication was to show how complex variables other than $x+iy$ can be utilized in spatial and physical problems.

Since x_1, y_1 in the equation

$$x_1 + iy_1 = e^{-i\theta}(x + iy)$$

are coordinates of the point x, y referred to axes θ degrees in advance of the original axes, it follows that x_3, y_3, z_3, given below, are coordinates of a point in space referred to a new system defined by the Eulerian angles ϕ, θ and ψ. In the equations

$$x_1 + iy_1 + jz_1 = e^{-i\phi}(x + iy) + jz,$$
$$y_2 + iz_2 + jx_2 = e^{-i\theta}(y_1 + iz_1) + jx_1,$$
$$x_3 + iy_3 + jz_3 = e^{-i\psi}(x_2 + iy_2) + jz_2,$$

j, like i and 1, is a separating symbol; also $i^2 = j^2 = -1$. By eliminating all quantities whose subscripts are 1 or 2, x_3, y_3, z_3 become expressed in terms of x, y, z and the angles ϕ, θ and ψ.

The equation

$$(a - ib)(x_1 + iy_1) = (a + ib)(x + iy)$$

signifies that the point x_1, y_1 is the point x, y displaced by a rotation through an angle θ where

$$\cos \tfrac{1}{2}\theta = \frac{a}{\sqrt{a^2 + b^2}} = a \text{ if } a^2 + b^2 = 1,$$

$$\sin \tfrac{1}{2}\theta = \frac{b}{\sqrt{a^2 + b^2}} = b \text{ if } a^2 + b^2 = 1.$$

Similarly the equation

$$(a - ib - jc)(x_1 + iy_1 + jz_1) = (a + b + jc)(x + iy + jz),$$

if the ij-term be omitted from the products as having no spatial interpretation, and if $a^2 + b^2 + c^2 = 1$, signifies that the point x_1, y_1, z_1 is the point x, y, z rotated about a line in the yz-plane passing through the origin.

Again, the equation

$$(a - ib - jc \mp ijd)(x_1 + iy_1 + jz_1) = (a + ib + jc \pm ijd)(x + iy + jz),$$

if the ij-terms be omitted from the products, and if $a^2 + b^2 + c^2 + d^2 = 1$, is the general expression for a displacement by rotation about a line passing through the origin. The quantities a, b, c and d are essentially Rodrigues' parameters and have the values

$$a = \cos \tfrac{1}{2}\omega, \quad b = \cos\gamma \sin \tfrac{1}{2}\omega,$$
$$c = -\cos\beta \sin \tfrac{1}{2}\omega, \quad d = \cos\alpha \sin \tfrac{1}{2}\omega,$$

α, β and γ denoting the direction-angles of the axis of rotation and ω the angle of displacement.

The use of a complex quantity was pointed out in connection with expressions for the acceleration when a moving particle is referred to polar coordinates—the complex used being a sort of extension of the ordinary symbol for angular velocity.

A semi-mechanical method of transforming from one plane to another by means of hyperbolic complexes of two dimensions was outlined. An example of such transformation having a physical application is implied in the equation

$$x + ijw = \cos^{-1}(X + ijW)$$

where X, W take uniform increments.

A three-dimensional analogue to conformal transformation was briefly noticed.

By means of functions of complex quantities an infinite number of solutions of Laplace's equation can be obtained, as well as of other analogous partial differential equations. Moreover, each solution obtained by Taylor's theorem yields several other solutions, the number depending upon the nature of the complex used.

Mr. L. A. Bauer spoke informally of disturbances just recognized on the record sheets at Cheltenham (Md.) magnetic observatory, that so far can be explained only as due to electric railroad currents, although the nearest point of such a road is thirteen miles away. He also described the precautions taken to protect the German observatory at Potsdam from trolley currents.

Charles K. Wead,
Secretary.

THE OREGON STATE ACADEMY OF SCIENCES.

The following papers have been presented before the Oregon State Academy of Sciences:

December 16, 'The Development of the Mushrooms and other Fungi' (illustrated), Professor A. R. Sweetser, State University.

January 20, 'General Motions of the Atmosphere' (illustrated), Mr. Edw. A. Beals, U. S. Weather Bureau, Portland; 'Animals in Mt. Rainier National Park,' Alden Sampson, Washington, D. C.

The first annual meeting of the academy occurred on February 17. President Sheldon, in his annual address, spoke on 'The Past and Future Work of the Academy.' Following the reports of the retiring officers, officers were elected for the ensuing year as follows:

President—Edmund P. Sheldon.
First Vice-president—A. L. Knisley.
Second Vice-president—C. Lombardi.
Third Vice-president—E. A. Beals.
Recording Secretary—Ernest Barton.
Corresponding Secretary—G. E. Coghill.
Treasurer—M. W. Gorman.
Librarian and Curator—L. L. Hawkins.
Trustee (for three years)—President Campbell, State University.

G. E. Coghill,
Corresponding Secretary.

UNIVERSITY OF COLORADO SCIENTIFIC SOCIETY.

During January and February, 1906, the society held eight meetings. The papers presented were as follows:

Professor Joseph H. Bair: 'Recapitulation, and its Bearing on the Problems of Life.'

Professor John B. Ekeley: 'Important Compounds of Carbon.'

Dr. George H. Cattermole: 'Diseases of the Heart and Blood Vessels.'

Professor Frederic L. Paxson: 'The Influence of the West in American History.'

Mr. G. S. Dodds: 'Microscopic Plant and Animal Life of Ponds and Ditches.'

Dr. Martin E. Miles: 'Preventive Medicine.'

Dr. Saul Epsteen: 'The Cost of Life Insurance as viewed from a Mathematical Standpoint.'

Mr. George M. Chadwick: 'The Development of Musical Form.'

The meetings have been well attended, chiefly by members of the faculty and by citizens of Boulder. The attendance has been from fifty to one hundred.

Francis Ramaley,
Secretary.

Boulder, Colo.,

DISCUSSION AND CORRESPONDENCE.

METEORITE SHOWER AT MODOC, KANSAS.

Investigation has been made by the writer of the meteorite fall which took place at Modoc, Scott County, Kansas, about 9:30 P.M., September 2, 1905. Mention of the fall was made in the local paper at the time, and in Science of March 9. The phenomena of the fall were observed by a large number of the inhabitants of Scott and the adjoining counties. The course of the meteorite, as learned by the writer through inquiries in several counties, was nearly due east. The phenomena were a sudden lighting up of the sky by a swiftly moving fireball, 'as big as a washtub,' which quickly exploded with three successive and widening discharges. The ex-

plosion must have occurred not far from Tribune, Greeley County, Kansas, since the interval between light and sound there was but a few seconds. The fall of stones, however, occurred at Modoc, about forty miles further east, the interval between light and sound there being between two and three minutes. It would appear, therefore, that after the explosion the stones traveled about forty miles before reaching the earth, at a velocity of about one third of a mile per second. Up to date thirteen fragments and individuals have been found, the heaviest having weighed eleven pounds. The other individuals and fragments found range in weight from seven pounds to a few ounces. The area over which they were scattered is one of about seven miles in length by two miles in width, extending nearly due east and west, the larger stones being found at the east end of the area. The principle that the smaller stones would fall first is thus corroborated. The stones appear to be of the type of white or gray chondrites and to have the usual composition of meteorites of this character. They are coated, for the most part, with a thick, black crust, although considerable breaking up took place in the atmosphere, so that some fragments have only a secondary crust or none at all. The total weight of individuals thus far collected is thirty-two pounds.

Six distinct meteorite localities are already known in western Kansas. Of these, one, Saline, Sheridan County, is an observed fall which took place at 9:30 P.M., November 15, 1898. That another fall should occur so soon within an area previously so favored seems to indicate some combination of forces relative to the area.

OLIVER C. FARRINGTON.
FIELD MUSEUM OF NATURAL HISTORY.

CAPTURE OF THE WEST INDIAN SEAL (MONACHUS TROPICALIS) AT KEY WEST, FLORIDA.

ON February 25, 1906, a party of fisherman killed a West Indian seal about five miles from Key West, where the specimen is now on exhibition.

It is a female, nine feet long and apparently quite old. The teeth are worn flat, the canines being worn down to the same level as the other teeth.

When discovered the animal was promptly harpooned and then killed with a shotgun. No one in Key West had succeeded in identifying it, and the exhibitors called it a sea-lion, until my arrival. It is, I believe, about thirty years since *Monachus tropicalis* was last seen in the Florida region. Mr. H. L. Ward collected a few specimens on the Triangle Islands in the Bay of Campeachy just twenty years ago. It has practically disappeared from the West Indian region.

Two specimens have been exhibited alive at the New York Aquarium, one of them from 1897 to 1903. These were also captured at the Triangles.

The Key West specimen is for sale and although badly mounted, the skin is apparently in good condition for remounting. The skull is mounted in the skin.

The specimen is in the possession of Jonathan Cates, Jr., Virginia Avenue, near North Beach, Key West, Florida.

C. H. TOWNSEND.
NEW YORK AQUARIUM.

ON THE ORIGIN OF THE SMALL MOUNDS OF THE LOWER MISSISSIPPI VALLEY AND TEXAS.

IN SCIENCE for January 5, Vol. XXIII., p. 35, Mr. A. C. Veatch, of the U. S. Geological Survey, takes up the question of the origin of the small mounds of the lower Mississippi and Texas, referring to an article of Mr. D. I. Bushnell in Vol. XXII., p. 712, followed by a lengthy quotation from Foster's 'Prehistoric Races of the United States,' citing from the manuscript notes of Professor Forshy: "There is a class of mounds west of the Mississippi Delta and extending to the Arkansas and above, and westward to the Colorado in Texas, that are to me, after thirty years of familiarity with them, entirely inexplicable." He also quotes from the report of Colonel S. H. Lockett's topographical survey of Louisiana and from De Nadaillac's 'Prehistoric America,' and gives the result of his own observations.

They are unaccountable to all of them. "They are not ant hills or animal burrows, and were not made by Indians."

I think the explanation is very simple and easily verified. The memories of the observers will confirm it. *They are the marks of uprooted trees.* They appear in every part of our country where there are forests and where they have disappeared. They are more numerous in certain light soils and in swamps and sometimes in overflowed lands.

Trees blown down in gales turn up a large mass of earth, which as the tree and roots decay settle into low, generally oblong, 'knolls' or mounds. On the New England farm where I spent my boyhood was an old pasture that had many such mounds. It had been timbered with hemlock and some hard wood, which had been cut down and burned up to make 'a clearing.' A crop or two had been taken from it, but the soil was too thin and poor to pay for cultivating. It was given over to pasturage. I recognized their character from seeing them in process of formation in the adjoining woods. One autumn a tornado passed over the farm, cutting a swath through the forests. Every tree of any size in its path was either overturned or broken off. A few years ago I visited the old place. A new woods had grown up, but the track of the tornado could be traced by the little hillocks.

I lived at one time for some years in the pine woods of Mississippi, near the central part of the state, and there witnessed the formation of such mounds. It was more rapid than at the north. The annual fires in a year or two burned up the pitchy tree and roots and the mound was soon rounded up.

On the prairies of Iowa, where trees never grew, there are no such mounds. On the flood plains of the rivers that are usually timbered they occur, and in the valley of the Mississippi where I reside I have met with much larger ones than those of the uplands, large trees and a soft soil. I think, therefore, that this solution is very obvious and satisfactory.

P. J. Farnsworth.

Clinton, Iowa.

Special Articles.

The Fish Genus Alabes or Cheilobranchus.

Nearly a century ago (in 1817) a group of eel-like fishes was named 'les *Alabès*' by Cuvier in his 'Règne Animal' (II., 235). All the information given was that they, like the Synbranchi, had a single undivided branchial aperture under the throat, well-marked pectorals with a small concave disk between them, a small operculum, three branchiostegal rays, pointed teeth, and intestines like those of the Synbranchi. Only one small species from India ('la mer des Indes') was referred to, but left unnamed.

This species ever since has remained unnoticed and unnamed till recently. In March, 1906, the concluding part of an article ('Le genre Alabès de Cuvier') by Leon Vaillant, published in the *Nouvelles Archives du Museum d'Histoire Naturelle* (4), VII., 145–158, was received, which throws some light on the subject. Vaillant identifies the genus with *Cheilobranchus* of Richardson. The alleged disk is so superficial that only a trace exists in some individuals and not at all in others, the so-called pectorals are rayless and approximately in the place of ventrals of many jugular fishes, the dorsal and anal are rayless, and the caudal has eight or nine ('huit ou neuf') articulated rays and is inserted around the margin of a hypural plate; there are intermaxillaries with imbricating ascending posterior processes and behind them small supramaxillaries; the teeth are compressed and blunt.

Such a combination of characters indicates a very peculiar type certainly not closely related to *Synbranchus;* Vaillant fully recognizes this and suggests (p. 156) that the genus is most nearly related to the Blennioidea and especially the Blenniidæ. The latter view is very questionable, but not enough has been made known to permit an authoritative opinion to be formed. Vaillant has overlooked a couple of references including important or original data.

Henri Cloquet ('H. C.') contributed to the 'Supplement' (p. 99) of the first volume of the 'Dictionnaire des Sciences Naturelles,' an article on 'Alabes, *Alabes* (*Ichtyol*)' defining

it as a genus ('genre') in essentially the same terms as Cuvier had done but adding data respecting the intestines. The additional data, however, were simply taken from Cuvier's definition of *Synbranchus* on the assumption that what was true of the latter was also of the former. The date of the title page of the 'Dictionnaire' is 1816, the year previous to that of the title page of the 'Règne Animal' (1817).

Cloquet's notice is important inasmuch as Cuvier gave only the French form ('les Alabès') of the name which many naturalists of the present day would regard as inadmissible. Cloquet's addition of the Latin name is also prior to Oken's similar action (*Isis*, 1817, 1183).

A. Valenciennes furnished for the 'Dictionnaire Universel d'Histoire Naturelle' (I., 237, 1841) a notice of the genus *Alabes* defining it by the single jugular branchial aperture, small pectorals, small opercle, and three branchiostegal rays, ignoring the alleged disk. He also ignored the attribution of the Indian habitat, and referred to Péron as the collector —'On ne connaît encore qu'une seule esp. de ce g., rapportée par Péron, lors du voyage du capitaine Baudin aux terres australes.' This solves the question as to habitat raised by Vaillant (p. 148).

I had long ago considered the possibility of the identity of *Alabes* and *Cheilobranchus* but the evidence was altogether insufficient to certify it, and had not the determination been effected by means of the types of *Alabes*, it might have been better to have rejected that name as indeterminable. As it is, it is perhaps necessary to revive it as the prior designation of *Cheilobranchus* and at the same time to substitute the family name ALABETIDÆ and the superfamily term ALABETOIDEA. In 1872, recognizing the decided difference between the genus and the Synbranchidæ, I proposed for it the family Chilobranchidæ and later (1896) further removed it from the Synbranchidæ as a superfamily (Chilobranchoidea). I have always regarded the group as having no determinate relationship to the typical Symbranchia and in 1872 retained it doubtfully among the Apodes ('Apodes? incerti sedis'). In 1885 ('Standard Natural History,' III., 100), contrasting it with the true Symbranchia I have remarked, 'on the other hand, the Chilobranchidæ (a family of doubtful relationship) have only about twenty-one abdominal and fifty-two caudal vertebræ.' The data are still quite insufficient to determine the affinities of the genus but sufficient to assure us that it is not related to either the Symbranchia or the Blenniidæ. It is to be hoped that a comparative study of the skeleton may be made. It should above all be ascertained what is the nature of the paired 'fins' and for this purpose the morphology of the supporting bones (if any) should be elucidated.

THEO. GILL.

THE FUNCTIONS OF THE FINS OF FISHES.

THE communication in a recent number of SCIENCE (December 15, 1905) by A. Dugès, entitled 'Note on the Functions of the Fins of Fishes,' deserves some attention, if only to correct some of the impressions it leaves with the reader. While the observations recorded in the above-mentioned paper are interesting enough as evidence from one more source, it must not be thought, as the author states, that the functions of the various fins have not been 'treated in a practical manner up to the present,' nor is it true that the regeneration of the fins 'has not yet been observed, or at least not published.'

For the latter point I refer the author to the work of Professor T. H. Morgan on 'Regeneration in Teleosts'[1] and 'Further Experiments on the Regeneration of the Tail of Fishes,'[2] dealing with the results of experimentation on the regeneration of paired and unpaired fins in five genera, *Tautogolabrus* (*Ctenolabrus*), *Opsanus* (*Batrachus*), *Fundulus*, *Stenotomus* and *Decapterus*.

As to the use of the fins, H. Strasser published in 1882[3] a good account of the move-

[1] *Archiv für Entwickelungsmechanik der Organismen*, X., 1900, pp. 120–134.

[2] *Ibid.*, XIV., 1902, pp. 539–561.

[3] 'Zur Lehre von der Ortsbewegung der Fische durch Beugungen des Leibes und der unpaaren Flossen.'

ment of fishes, dealing especially with the caudal as a 'propulsatorisches Organ.' The use of the tail and the flexion of the body have been generally recognized by writers on the fishes. The experiments performed by Dugès were made on sharks twenty years ago by Paul Mayer and accurately described in 'Die unpaaren Flossen,'[4] with practically the same results.

The account of Mr. Dugès called to mind certain of my own observations made several years ago, but not published. As these were not entirely in accord with those of the above writer I decided to repeat the studies for the sake of confirming either my own work or that of Mr. Dugès. Director Charles H. Townsend, of the New York Aquarium, very kindly granted me space and material. I have to thank also Mr. W. I. DeNyse, of the aquarium, who assisted me in many ways and confirmed some of the observations. The experiments were chiefly upon *Fundulus heteroclitus*, a hardy species in which the fins are of rather large size.

Space will not permit the recounting here of all the experiments made by removing the fins in all possible combinations, but a few of the results may be stated. When a single pectoral fin was removed the fish tended to turn partly on one side, due probably to the action of the pectoral of the opposite side. This, however, the fish soon learned to regulate. After the removal of both pectorals the fish when swimming slowly apparently moved as usual, but when forced to turn quickly it was unable to accurately balance or otherwise undergo movements requiring nice adjustment. This is much more marked in the short, compressed or rhomboidal type of fish. A scup (*Stenotomus chrysops*) with both pectorals removed is very helpless when attempting to undergo certain movements which are ordinarily performed with the greatest ease. A study of the movements of the many species of fishes in the New York Aquarium is entirely confirmatory of the view that one function of the pectoral is to balance and accurately adjust the fish in swimming.

[4] *Mitth. z. Zool. Sta., Neapel*, VI., 1886.

Another very evident function of the pectoral, at least in many species, is locomotion. *Fundulus* occasionally swims slowly forward with the use of the pectorals alone, or it can reverse the movement and swim backward very slowly, and I have even seen them swim slowly in a circle using only one pectoral. These are not to be considered the most ordinary movements in *Fundulus*, but at least they show that the fins are capable of being used for these purposes. In this connection the doctor-fish (*Teuthis hepatus*) is one of the most interesting. This active fish swims rapidly around the aquarium tank with the body apparently quite rigid and, using the pectorals like a pair of wings, can swim either forward or backward. The tautog (*Tautoga onitis*) often swims leisurely, using only the pectorals and dorsal.

Another well-marked function of the pectorals is their use as a drag or brake in stopping. It can be noted in the movements of many fishes in the aquarium that in stopping the pectorals, and often the pelvics also, are thrown out at right angles to the body, thereby increasing very greatly the resistance to the water. Fishes with the pectorals removed would at first frequently run against the side or bottom of the tank, but later they learned to avoid this by a strong movement of the tail. During the course of my experiments on this point I was pleased to find in Dr. H. H. Swinnerton's latest paper[5] a statement to the same effect, and in a recent conversation Professor R. S. Lull offered the same suggestion.

With regard to the observation made by Mr. Dugès that the pectorals are moved when the fishes are stationary in order 'to produce currents in the water to renew the portions of this which had already yielded their oxygen to the gills and remained charged with carbonic anhydride,' I must say that, while at first glance it looks like a probable explanation, a little study of various types of fishes will serve to show the fallacy of the statement. In the first place the water is not renewed at

[5] 'A Contribution to the Morphology and Development of the Pectoral Skeleton of Teleostomes,' *Q. J. M. S.*, November, 1905.

the gill region in breathing but is taken in at the mouth and forced backward over the gills and out in a backward direction. Secondly, there are certain types of fishes which possess no pectoral fins and yet manage to keep up their supply of oxygen. Thirdly, there are certain fishes which live upon the bottom, like the skates, or even buried under the sand, as the flounders, which are unable to make any such use of the pectorals and yet breathe without difficulty. Lastly, it is a point of observation without a single exception in my experience that the ordinary, actively swimming type of fish when resting on the bottom does not move the fins at all. Observations of several years' standing, on fishes in and out of aquaria, have recently been supplemented by careful studies at the New York Aquarium on many different types of fishes, both fresh water and marine, and the result is invariably as above stated.

On the other hand, all the fishes that I have observed use the pectorals when they are suspended in the water. Moreover, other fins are often brought into use at the same time. Thus the elongate pike (*Lucius*) and gar (*Lepisosteus*) are seen to move the pelvic fins slowly, coordinately with the pectorals, and short-bodied forms such as the butterfly-fish (*Chætodon*) move the pectorals and caudal, while in species intermediate in form the caudal, anal and dorsal may, any or all, be used in addition to the paired fins when suspended in the water. This array of facts makes it quite clear that the function of the pectorals when the fish is stationary is that of equilibration and not the removal of water charged with carbon dioxide.

It is impossible to formulate a rule for the pectoral fins which will cover all cases, since in the more or less aberrant species this fin may be used for creeping on the bottom or even for progress on land or in the air, or it may enter into the formation of a sucking disc, or rarely may be absent; but as far as the usual swimming type of fish is concerned, the following uses are most in evidence:

Guiding and balancing the body in swimming;
To act as a brake in arresting the progress;
Equilibration when suspended stationary in the water, and
Locomotion, either forward or backward.

The pelvic fins are generally used much in the same way as the pectorals, though of less importance. The vertical fins may assist the caudal in locomotion or the pectorals in balancing. In terete types of fishes the dorsal and anal seem to have much the same function as a centerboard on a boat, to prevent the body from slipping sidewise through the water when the caudal portion is flexed in making the stroke. In fishes of this type which have had these fins removed the body is seen to wriggle to a greater extent than in those which possess the fins.

In conclusion, I wish to say that no one appreciates better than the writer the highly adaptive character of the fins, especially those of teleosts, and that any one who searches for exceptions will find them—it would probably be much more difficult to find two species in which all the fins are used in exactly the same manner—and yet I believe that the general functions of the fins are about as above outlined.

RAYMOND C. OSBURN.
COLUMBIA UNIVERSITY,
January 18, 1906.

COLUMBIA FIELD WORK IN 1905 INTERCOLLEGIATE FIELD COURSES IN GEOLOGY.

DURING the latter part of May and early part of June, 1905, a party of nine graduate students from the department of geology, Columbia University, under the guidance and direction of Professor A. W. Grabau, made a somewhat extended field trip through New York State, visiting and studying in considerable detail many of the type localities and typical developments of the Paleozoic formations. The object of the trip was, by actual field work, to make each student familiar with the general appearance and lithological character of the various formations as they occur in the field, as well as their stratigraphical relation to one another and to the underlying crystalline rocks, and by personal collecting, to make him familiar with the characteristic fossils of each formation. Whenever opportunity was afforded a study was also made

of structural, tectonic and physiographic features.

The party left New York on May 20, and made its first stop in the vicinity of Rondout and Kingston. Here, in the exposures laid bare in the quarries of the Vlightberg Hill, on the North Hill, and along the railroad tracks toward Whiteport, Binnewater and Rosendale, excellent exposures were found of the Ordovicic (Hudson River group), unconformably overlain by the Siluric, including the Schawangunk conglomerate, Binnewater sandstone, Rosendale cement, Cobleskill limestone, Rondout waterlime and Manlius limestone. These are in turn conformably overlain by the lower and middle Devonic, namely, the Coeymans limestone, New Scotland shale, Becraft limestone, Port Ewen limestone, Oriskany sandstone and limestone, Esopus grit and the Onondaga limestone. The Siluro-Devonic contact between the Manlius and Coeymans is so sharp and distinct that a member of the party secured a hand specimen Siluric at one end, Devonic at the other and the dividing line clearly marked in the middle. A careful study was also made of the structural features of this region, including the overthrust fault and repeated formations of the Vlightberg and North Hill described in the Report of the New York State Paleontologist for 1902.[1]

The next stop was made at Hudson, whence visits were made to the Hudson River shales at Mount Merino and to the various formations exposed at Becraft Mountain. At Becraft Mountain upon the upturned and eroded Hudson shales is deposited the Manlius limestone and this is followed directly and conformably by the Coeymans, New Scotland, Becraft, Port Ewen, Oriskany, Esopus, Schoharie and Onondaga. Each of these formations was studied in considerable detail and characteristic fossils were collected. Attention was also called to the tectonic features of the mountain and the tendency of streams to flow and swamps to form at the contact between the Oriskany and overlying Esopus beds.

[1] New York State Museum Bull. 69, pp. 1063–1065, by A. W. Grabau, and pp. 1176–1227; by Gilbert Van Ingen and P. Edwin Clark.

Passing on to Schoharie, a day was devoted to the study of the Siluric and Devonic formations as exposed there. A part of the time was spent in carefully studying and collecting fossils from the formations exposed from the bottom of the Schoharie Creek to the summit of West Mountain. In the bed of the creek were found sandstones of the Hudson group, and resting upon these were the Salina sandstones (Binnewater) and shales (Brayman). From this as a starting point we ascended the West Mountain and in doing so passed over and examined the Cobleskill, Rondout and Manlius of the Siluric; the Coeymans, New Scotland, Becraft, Port Ewen, Oriskany, Esopus, Schoharie and Onondaga of the Devonic, the Onondaga limestone forming the hard resistant capping of the mountain. This locality furnished a splendid illustration of the behavior of the various formations under weathering, the hard resistant limestones forming cliffs while the shales and softer beds formed wooded or cultivated slopes. Later in the day the party visited and carefully examined the formations exposed in the limestone quarries east of the village.

A short stop was made at Little Falls to examine the Beekmantown limestone and its contact with the underlying crystalline rocks and to note the peculiar physiographic features of the Mohawk Valley at this point. Then the party moved on to Utica, whence trips were made to Trenton Falls and Washington Mills. At Trenton Falls the Trenton beds were carefully examined in the walls of the gorge and fossils were collected both from the beds in place and from the material excavated and thrown out by the Utica Electric Light and Power Company when installing their plant at the side of the river. At Washington Mills were found excellent exposures of Utica shale and lower Loraine, and resting disconformably[2] upon the latter the Oneida conglomerate, which in turn is succeeded conformably by the Clinton beds. These Clinton beds were studied in the gorge of Swift Creek, the type locality.

At Pulaski, along the gorge of Salmon

[2] Grabau, Science, N. S., Vol. XXII., pp. 534, 1905.

River, a few miles from Lake Ontario, were found extensive exposures of the upper Loraine shales, and these in certain layers were found to be very fossiliferous.

From Syracuse a short trolley trip was made to the Solvay quarries at Split Rock and the upper Siluric and lower Devonic formations were examined, and the Siluro-Devonic contact noted. Owing to the fact that this trip was made on a very wet afternoon, no detailed work was done.

From Syracuse a side trip was also made to Tully, where the type locality of the Tully limestone was visited, and fossils were collected from the *Hypothyris cuboides* fauna, famous as representing the mingling of European and American faunas at the beginning of upper Devonic time. The Moscow shale, underlying the Tully limestone, was examined and many fossils collected from it where it is exposed near the Solvay salt wells, a few miles from Tully village. Tinkers Falls, some six or eight miles from Tully, was visited. Here a small creek has cut a gorge through the black Genesee shales above and falls over the edge of the exposed Tully limestone. This limestone, some twenty or thirty feet thick, projects out from the cliff for nearly thirty feet, the soft Moscow shales below having been eroded away.

At Rochester the party made a short stop and hasty examination of the lower Siluric formations as exposed in the Genesee gorge, and then went on to Niagara Falls and vicinity. Here a very careful study was made of the Medina, Clinton, Rochester and Lockport formations, and many fossils were collected from them. An attempt was made to picture the region as it was in preglacial time, when the watercourses were very different from what they are now, and to understand the cause and meaning of the physiographic features now existing. After spending several hours at the Upper Rapids, Goat Island, the Lunar and American Falls, the party followed the gorge along the American side, walking down the tracks of the New York Central Railroad as far as Lewiston. Then a car was taken up the Canadian side and stops were made at the Whirlpool Rapids, and at some of the best points for viewing the Horseshoe Falls.

After completing the work at Niagara, the party went south to Eighteen Mile Creek and the shore of Lake Erie. Eighteen Mile Creek was followed from the Lake Shore Railroad bridge to where it empties into Lake Erie, then we walked along the Lake Shore section for several miles to both the north and south of the creek. Here were found excellent exposures of the Hamilton and Portage groups, including the Ludlowville shales, Encrinal limestone, Moscow shale, Styliolina limestone, Genesee, Middlesex, Cashaqua and Rhinestreet shales. An abundance of fossils was collected from most of these beds, and many of the beds were followed for miles along their excellent and continuous outcrops.

From Buffalo short trips were made to Lancaster, Williamsville and North Buffalo. At Lancaster the Stafford limestone was found and many fossils collected from it. The peculiar position of this limestone between two beds of middle Devonic shale was carefully examined in an endeavor to understand why it was there and how it was caused—whether by change of sedimentation or continental oscillation. The party saw evidence of the fact that after Onondaga time there was a gradual shoaling of the waters over central and western New York, as is indicated by the deposition of shales instead of limestones. Twice during Marcellus time there was a return of pure water conditions, with an invasion of a western fauna. One of these is marked by the Agoniatite limestone and the other by the Stafford limestone.

At Williamsville were found the Bertie and Cobleskill (Greenfield), with the Onondaga resting disconformably upon the latter. In the Onondaga, where it was being quarried, was found a most perfect example of a Paleozoic coral reef. The reef in the center of the quarry was made up of massive coral heads, some of them five and six feet across. On either side the bedding planes sloped gently away from the center of the reef. Quarrying operations were stopped when the reef was reached because the massive unstratified limestone could not be readily worked.

In the quarries at North Buffalo the disconformity between the Bullhead and Onondaga was studied. This time-gap is faintly marked, but very careful study has shown that a thin layer of sandstone, in some places hardly more than a single layer of Quartz sand grains, lies between the two disconformable formations. In one place there is a remarkable dike of the intervening sand injected into the underlying formations, extending clear through the Bull-head into the Bertie.

On the return trip from Buffalo to New York the party made one stop at Portage to examine the upper gorge of the Genesee River, and the upper Devonic formations exposed there. Members of the party who desired to do so then joined the students from the School of Mines for a week's field work in the region about Newburgh, where the crystalline rocks of the Highlands and the stratigraphy and structure of the Skunnemunk Mountain region were studied and mapped in detail.

Thomas C. Brown.

Columbia University.

Preliminary Note on the Embryogeny of Symplocarpus Fœtidus Salisb.

Last year Mr. W. H. Lippold, while engaged in graduate work in the botanical department of the University of Minnesota, undertook a study of the embryo-sac development and embryogeny of *Symplocarpus fœtidus* Salisb.

The work was not carried to completion, some important points being left undecided because of lack of material. The writer, upon the suggestion of Professor Lyon, has taken up the unfinished work and hopes to bring out in a subsequent paper an account of the observations made.

Some interesting facts have already been established and it seems advisable to call attention to these at the present time. Briefly stated they are as follows:

The gynœcium is almost always one-chambered, although two chambers infrequently occur.

The ovule is solitary, axial, orthotropous and pendant from the roof of the chamber.

The two integuments which are formed do not completely enclose the nucellus.

A massive endosperm develops and rapidly consumes the nucellus, the inner and outer integuments, and pushes back into the basal tissue of the ovule.

The protocorm soon assumes a somewhat campanulate shape with a short, thick suspensor at its narrower, proximal end.

The radicle and plumule are both differentiated at the suspensor end of the protocorm.

The developing protocorm completely consumes the endosperm as well as all the remaining ovular tissue except the base of the hilum, which remains closely appressed to its broad end.

The embryo, therefore, comes to lie free in the chamber of the gynœcium without any trace of seed coats or enveloping membranes.

The mature embryo is nearly spherical and measures 8–11 mm. in diameter.

The epidermal and subepidermal cells have their walls considerably thickened, while the walls of the former are distinctly cuticularized.

The metacormal axis is short and bent back upon itself, the plumule lying close to the radicle.

The so-called 'seeds' of *Symplocarpus fœtidus* are naked embryos.

C. Otto Rosendahl.

University of Minnesota.

Lower Paleozoic Formations in New Mexico.[1]

The older Paleozoic strata have generally been considered absent in New Mexico. During the past summer, while engaged in field work for the U. S. Geological Survey, under the direction of Mr. Waldemar Lindgren, the undersigned found Cambrian, Ordovician, Silurian and Devonian formations at various places along a belt which crosses Grant, Sierra and Luna counties, and extends from the east side of the Rio Grande westward beyond the Arizona line and probably connects with the similar formations of the Clifton copper district in Arizona.[2]

[1] Published by permission of the director, U. S. Geological Survey.

[2] W. Lindgren, professional paper, U. S. Geological Survey, No. 43.

The localities where these rocks are best exposed are the Caballos Mountains, the Hillsboro and Kingston mining districts on the east side of the Black Range, in the vicinity of Cooks Peak and the Florida Mountains. In these places the Cambrian, Ordovician and Devonian are found. At Lake Valley and west of Silver City, near the mines of Chloride Flat, in addition to the foregoing formations, true Silurian limestone separates the Devonian and Ordovician strata.

A more extended account of these formations will appear in a forthcoming number of the *American Journal of Science.*

C. H. Gordon,
L. C. Graton.

A NEW METHOD FOR THE HOMOPLASTIC TRANSPLANTATION OF THE OVARY.

The transplantation of the ovaries has been performed by Knauer, Gregorieff, Arendt, Ribbert, Schultz, Herlitzka, Foa, Guthrie, etc. These experiments showed that young ovaries are often able to 'prendre' (or grow successfully), while the transplantation of adult ovaries is practically unsuccessful. These negative results are probably due mainly to the defective technic employed, the usual method being to sew the transplanted ovary to the peritoneum, and leaving to nature the reestablishing of the circulation. In order to obtain constant results, it is necessary to use a much more precise method. Therefore, we attempted to transplant an ovary by modifying as slightly as possible its circulation, its innervation and its connections with the Fallopian tube.

We used our method of *transplantation in mass,* which permits the transplantation of ovaries of cat, with their vessels, and preserves a part of the nervous apparatus of the organ.

The abdomen of a cat *A* being open, a large peritoneal flap, extending from the right ovary to the portion of the aorta corresponding to the mouth of the ovarian artery, is cut by proper incisions. The Fallopian tube is severed near its fimbriated extremity. The posterior surface of the peritoneal flap is carefully separated from all the posterior tissues excepting the ovarian vessels, which are permitted to retain their connection with it. Then the segments of the aorta and vena cava, from which the ovarian vessels originate, are extirpated. The specimen consisting of the ovary and a part of the Fallopian tube united to the segments of the aorta and vena cava by a cellulo-peritoneal ribbon and the ovarian vessels, is then placed in a glass of isotonic sodium chloride solution.

The abdomen of a cat *B* is then opened by performing a right half circular transversal laparotomy. The right ovary and the external part of the Fallopian tube are resected. The aorta and vena cava are cut at the point of the mouth of the ovarian vessels. The anatomical specimen taken from cat *A* is removed from the salt solution and put into the abdominal cavity of cat *B*. The segments of the aorta and vena cava of cat *A* are interposed between the cut ends of the aorta and vena cava of the cat *B*. The peritoneal flap is stretched on the posterior abdominal wall in such a manner that the transplanted ovary takes the place of the normal ovary. The circulation through the aorta and vena cava is reestablished. The red blood flows through the ovarian artery, the ovary becomes rosy, and the dark circulation is slowly established through the venous plexus and the ovarian vein. After a few minutes the circulation appears similar to that of the normal ovary. The end of the transplanted Fallopian tube is united to the end of the normal one. At last the suture of the abdominal wall is performed.

This operation is not dangerous, for the animals after a few hours appear to be in normal condition. Our experiments were performed on ordinary laboratory animals of uncertain breeds. They are interesting, therefore, only from a technical point of view. We intend to very soon perform a series of similar operations on pure bred animals, preferably dogs or pigs, with a view of studying the problem of transmission of characters and related problems.

Alexis Carrel,
C. C. Guthrie.

The Hull Physiological Laboratory,
University of Chicago.

CURRENT NOTES ON METEOROLOGY.

ANNALS OF MONT BLANC OBSERVATORY.

Vol. VI. of the *Annals of the Mont Blanc Observatory* (Vallot), bearing the date 1905, bears witness, in the author's preface, to the difficulties under which M. Vallot has labored, and to the indomitable energy with which he has pursued his work in spite of severe handicaps. A rheumatic affection, contracted during his long sojourns on Mont Blanc, has prevented M. Vallot from continuing his ascents to the observatory, and even from reducing his observations. The present volume was begun in 1904, but another severe illness prevented its completion until the year 1905. Although in much better health, the author is not yet sufficiently strong to undertake the ascent of Mont Blanc.

Vol. VI. contains as its most important paper, M. Vallot's 'Expériences sur la Respiration au Mont Blanc dans les Conditions habituelles de la Vie' (136 pp.), in which a detailed account is given of a large number of observations of physiological importance, made by the author on himself as well as on other persons, during the ascent of, and during sojourns on, Mont Blanc. This is one of the most complete accounts of the physiological effects of high altitudes that we have seen.

A second paper, by MM. Mougin and Bernard, inspectors of forests, 'Etudes exécutées au Glacier de Tête-Rousse,' deals with the interesting observations made by these officials with a view to preventing in the future another catastrophe such as that which destroyed the baths of Saint-Gervais some years ago. The meteorological station established by M. Vallot on the Grands Mulets, and which he could not make use of owing to his illness, was taken by MM. Mougin and Bernard to the Tête-Rousse, where a series of observations has been carried on regularly throughout the summer months, at about 3,200 meters above sea level. The publication of these results has been entrusted to M. Vallot, and begins in the present volume.

Two other papers concern cartographic subjects in connection with the Mont Blanc area.

METEOROLOGISCHE ZEITSCHRIFT.

The *Meteorologische Zeitschrift*, which has, since 1889, been published in Vienna (Hölzel), is transferred to Braunschweig (Vieweg) with the first number for 1906. Vol. XXIII. of the *Zeitschrift* begins with this number. When the volumes of the *Zeitschrift der k. k. Oesterreichischen Gesellschaft der Meteorologie* are taken into account (these two publications having been consolidated in 1884) the number of the new volume is XLI. There is no change in the editorship, Hann and Hellmann continuing in charge, as before. This invaluable meteorological journal seems to have gained new vigor with the beginning of a new year. Woeikof contributes three papers, one on the relation between the temperature of the lower air and that of the upper surface of land and water, and two on the character of rainfalls. Rainfalls are classified by Woeikof in the following four types: (*A*) Thunderstorms of moist regions, short, heavy rainfalls; (*B*) rains of dry regions, very short, and usually of moderate amount; (*C*) monsoon rains in their best development, long duration, but of moderate intensity; (*D*) rains of higher latitudes, especially in autumn and winter, long duration, but generally light.

Götz, of Munich, contributes a discussion of the progressive change in the condition of the soil as regards moisture, which is of interest in connection with the prevailing popular views concerning changes of climate. Von Ficker describes the development of valley haze from the dissipation of stratus clouds. Hann gives the results of a new determination of the mean temperatures of the whole earth, as well as of the eastern and western hemispheres. These temperatures have been determined a good many times before, but these latest results include the data given in Mohn's table of normal temperatures of latitudes 60° to 90° north (Report of the Nansen Expedition), in which the observations made by the *Fram* Expedition were utilized. This is a very important addition to our knowledge of the temperatures of the Arctic, and naturally leads to revision of previous calculations of mean temperatures for the earth.

FORESTS AND RAINFALL.

PROFESSOR J. SCHUBERT, director of the meteorological division of the Prussian forestry experiment station work, has made a study of the relation of forests and precipitation in Silesia, taking as a basis the rainfall map published by Hellmann in 1899. The conclusion reached—the author himself says that his estimates are to some extent uncertain—is that forests seem to produce an increase in precipitation. If one half of the observed difference is set down as being due to the increased protection of the gauges set up in or near the forests, the actual effect of the trees themselves would roughly correspond to an increase in altitude of 40 meters (*Met. Zeitschr.*, December, 1905).

NOTES.

A NEW aeronautical observatory is to be established at Friedrichshafen, on the shore of the Lake of Constance, for carrying out meteorological observations in the free air by means of kites. The money for original equipment, and for annual expenses, is to be contributed by Germany, Wurtemberg, Bavaria, the Duchy of Baden and Alsace-Lorraine. Observations are to begin January 1, 1907. Boats of special construction are to be built for flying the kites (*Ciel et Terre*, January 16, 1906).

THE French Glacier Commission has been carrying out a series of measurements of snowfall at different altitudes on Mont Blanc. In general it appears that the snowfall increases with altitude between 1,000 and 3,200 meters, but the individual gauges do not give satisfactory results (*Met. Zeitschr.*, December, 1905).

R. DEC. WARD.

CARBON SUBOXIDE.

THE interesting announcement of the discovery of a new oxide of carbon has just been made by Messrs. O. Diels and B. Wolf,[1] working in E. Fischer's laboratory. When the vapor of diethyl malonate is passed over phosphorus pentoxide, heated at 300°, it suffers the loss of two molecules of alcohol, which, of course, is immediately converted into ethylene and water, and there results an oxide of carbon, C_3O_2; this is one of the two possible anhydrides of malonic acid, the other being

$$CH_2<\begin{matrix}CO\\CO\end{matrix}>O.$$

The reaction which takes place is represented by the following equation:

$$CH_2(COOC_2H_5)_2 \rightarrow 2C_2H_4 + 2H_2O + OC:C:CO.$$

The new compound is a colorless, highly refractive, very volatile liquid, boiling at 7°; it has an intense odor of acroleïn and mustard oil, and rapidly attacks the mucous membrane of the eyes, nose and respiratory organs.

Chemically, it is extremely reactive; with water malonic acid is quickly regenerated; dry hydrogen chloride gives malonyl chloride, $CH_2(COCl)_2$; aniline and ammonia yield malonanilide, $CH_2(CONHC_6H_5)$ and malonamide, $CH_2(CONH_2)_2$, respectively.

Although carbon suboxide can be volatilized under reduced pressure, so as to admit of the determination of its vapor density, yet it slowly undergoes spontaneous decomposition at the ordinary temperature. The product is a dark red solid, which dissolves in water, giving an intense eosin red color. At 37° the decomposition of the suboxide is much more rapid and at 100° it is instantaneous. Under these conditions there is formed a deep blackish-red, very hard substance. The two solids appear to be the oxides of carbon, C_4O_3 and C_6O_4, which were described about thirty years ago by Brodie and by Berthelot.

Even from the brief description of carbon suboxide given above it will be seen that its properties and mode of formation are in admirable accord with the formula OC:C:CO, and that it possesses three series of relationships, according to whether it is regarded as being: (1) an oxide of carbon, (2) an anhydride of malonic acid, (3) a carbon carbonyl, similar to those of nickel and iron, $Ni(CO)_4$ and $Fe(CO)_5$, which excited so much interest at the time of their discovery some years ago.

J. BISHOP TINGLE.

[1] *Ber. d. Chem. Ges.*, **39**, 689, 1903.

ANALYSIS OF THE RESULTS OF THE TWELFTH CENSUS.

The Bureau of the Census has just issued a special report analyzing and discussing statistics collected and published at the twelfth census, particularly statistics of population. This work was prepared under the direction of Professor Walter F. Willcox, of Cornell University, who was formerly one of the chief statisticians in the Census Office. The title of the volume is 'Supplementary Analysis and Derivative Tables: Twelfth Census,' and, as this title suggests, the work comprises two parts. The first part, or 'Supplementary Analysis' is a series of statistical studies, some of which have already been published by the Census Bureau in bulletin form, while others are now given to the public for the first time. These studies discuss in an interesting manner such topics as growth of population, marital condition, illiteracy, interstate migration, proportion of children in the population and proportion of breadwinners. One unique feature is a summary prefacing each study and stating concisely the conclusions reached by the writer. To some extent the work is a collaboration, for while most of these analytical studies or chapters were written by Professor Willcox, some have been contributed by other writers—the chapter on age statistics, by Professor Allyn A. Young, of the University of Wisconsin; the chapters on illiteracy and interstate migration, by Dr. Joseph A. Hill, of the Bureau of the Census; the chapter on vital statistics, by Dr. John Shaw Billings; and that on the negro farmer, by Professor W. E. B. DuBois, of Atlanta University.

The second part of the volume, the 'Derivative Tables,' is a series of tables derived from the published data of the twelfth census. One feature of special interest in these tables is the classification of population according to the size of the place of residence. This brings out the differences and contrasts between the city and country population; also in many instances between the population of large cities, of middle-class cities and of small towns and rural districts. Thus one may study statistically the influence of city as compared with country in connection with such questions as age and sex, immigration, marriage, illiteracy, school attendance and size of families. The tables include, also, an extended classification of population by birthplace, giving the numbers born in each state or territory and in each of the principal foreign countries which have contributed to the growth of our population by immigration. Certain derivative birthplace tables give ratios for each of the last six censuses, thus making it possible to trace for each state and territory the changes in the composition of the population brought about during the half century by the immigration of foreigners, as well as by the interstate migration of natives.

AWARDS OF THE ROYAL GEOGRAPHICAL SOCIETY.[1]

The council of the Royal Geographical Society has decided to award the royal medals and other honors for 1906 as follows:

With the approval of the King, the two royal medals have been awarded to M. Alfred Grandidier and Dr. Robert Bell, F.R.S. The founder's medal is awarded to M. Grandidier for the results of his many years' work on the Island of Madagascar. Since 1865 M. Grandidier has devoted himself to the exploration of the island and to the publication of its results. He spent five years in the island, traversing it three times throughout its breadth. The result of this exploration included geography, geodesy, geology and natural history in all its branches; it enabled a valuable map of the coast of the Imerina and of the Central Province of the Hova kingdom to be made. In 1875 he began the publication of his great 'Histoire Physique, Naturelle, et Politique de Madagascar' with the cooperation of the various *savants*. The whole when completed will form about 52 large quarto volumes. Altogether M. Grandidier's lifework has been of the highest value in scientific geography, and forms the basis of our knowledge of Madagascar.

The patron's medal has been awarded to Dr. Robert Bell, F.R.S. During 45 years of field work he has mapped a large area of Canada

[1] From the London *Times*.

previously unknown, including the Gaspé Peninsula; the coasts of the Labrador Peninsula, including its Atlantic, Hudson Strait and Hudson and James Bay sides; most of the southern coast of the Island of Baffinland, some of the large islands of the northern end of Hudson Bay, nearly the whole coast of Hudson Bay, the great rivers flowing into James Bay, and many of the great lakes. He has written 200 reports on various scientific subjects, and has greatly extended our knowledge of vast areas of the western continent.

The Victoria research medal has been awarded to Professor W. M. Ramsay, D.C.L., LL.D. Professor Ramsay has been working at ancient geography for nearly 30 years, and is the acknowledged leader of all Europe in that branch of study. His work in Asia Minor has revolutionized the methods upon which such study is based, and has originated a whole school of students in this country and in France and Germany. What he has done for history can hardly be exaggerated. Till his advent it was impossible to understand either the campaigns which ended in the Roman occupation or those which marked stages in the long struggle of Christianity and Islam. Professor Ramsay's surveys and notes have been of invaluable service to the cartographers of Asia Minor.

The Murchison award has been given to Major H. R. Davis for his explorations in the Shan States, Kachin Hills, Yun-nan, Siam and Sechuan.

The Gill memorial has been awarded to Major A. St. Hill Gibbons for the important exploring and survey work which he has done in Barotseland on his two expeditions in 1895–96 and in 1898–1900.

The Cuthbert Peek fund has been awarded to Major H. H. Austin, C.M.G., D.S.O., R.E., for his exploration in the Lake Rudolf region, the Sobat region, and his hazardous expedition from Omdurman to Mombasa *viâ* Lake Rudolf in 1900 and 1901.

The Back bequest goes to Major R. G. T. Bright, C.M.G., for his eight and one half years' exploring work in the Sudan, Uganda and east Africa. The Sobat, Akobo and Rudolf regions were explored by him under Major Austin in 1899 and 1901. In 1902–4 he worked under Colonel Delmé Radcliffe on the Anglo-German boundary commission west of Victoria Nyanza. In 1904–6 he worked under Colonel Smith on the Anglo-German boundary commission east of the Lake to Kilimanjaro.

THE CONGRESS OF THE UNITED STATES.

March 24, 1906.—Mr. Henry, of Connecticut, from the Committee on Agriculture, to which was referred the bill of the House (House Resolution 7,019) for the protection of animals, birds, and fish in the forest reserves, and for other purposes, reported the same without amendment, accompanied by a report (No. 2,494); which said bill and report were referred to the House Calendar.

March 26, 1906.—The bill authorizing Professor Simon Newcomb to accept a decoration conferred upon him by the Emperor of Germany, passed the House.

A bill for a public building for the United States Geological Survey at Washington, was introduced by Mr. Sherman and referred to the Committee on Public Buildings and Grounds.

March 27, 1906.—Mr. Capron, from the Committee on the Territories, to which was referred the bill of the House (House Resolution 13,543) for the protection and regulation of the fisheries of Alaska, reported the same with amendment, accompanied by a report (No. 2,657); which said bill and report were referred to the House Calendar.

March 29, 1906.—Mr. Lacey, from the Committee on the Public Lands, to which was referred the bill of the House (H. R. 15,335) for the protection of game animals, birds, and fishes in the Olympic Forest Reserves of the United States, in the State of Washington, reported the same without amendment, accompanied by a report (No. 2,744); which said bill and report were referred to the House Calendar.

United States Senate: March 28, 1906.—Mr. Fulton, from the Committee on Public Lands, to whom was referred the bill (S. 4,487) granting to the State of Oregon certain

lands to be used by it for the purpose of maintaining and operating thereon a fish hatchery, reported it without amendment, and submitted a report thereon.

THE OHIO STATE UNIVERSITY.

The Ohio State University has just emerged from a somewhat strenuous struggle to have the legislature of Ohio declare a policy for higher education. The necessity for such a declaration arose from the fact that there are three other educational institutions in Ohio that receive part of their income from the state. One of these is an institution for colored people and is not an important factor. The other two are venerable institutions, founded on government land grants, prior to the organization of Ohio as a state. These did not receive state aid until recently, but having once begun to receive it, became increasingly ambitious in their plans, until it became necessary for the state to decide whether it should distribute its funds among three institutions, in which event none of them could ever reach a really high position among the colleges of the land, or concentrate it upon one, which should be made a university, in fact as well as in name.

The latter course was finally adopted in a specific declaration of principle, so unequivocal that it will probably prevent the reopening of the question hereafter. It provides for one state university with an unlimited future; the two other schools are maintained as colleges of liberal arts, with moderate incomes which are not to be hereafter increased, but they are prohibited from going into the field of technical or professional instruction. The normal schools which are attached to each college are maintained, with provision that the normal work may be increased as need arises.

In addition to this declaration of policy, the legislature made more liberal appropriations to the university than ever before. For the two-year period, 1906–08, the appropriations stand as given in the table. This is an increase over the preceding two years of 18 per cent.

The university also suffered from the opposition of the private sectarian colleges for many years, but this has gradually become less vigorous and practically ceased two years ago. In the present struggle, the sectarian colleges were either inactive or supporting the state university.

The happy settlement of these two controversies leaves the future path of the institution free from serious obstacles, and it may now be expected to make rapid progress.

A levy of .16 mill on all taxable property of the state	$ 692,000.00
Part of a building for electrical and mechanical engineering	75,000.00
A woman's dormitory	60,000.00
Buildings and equipment for the College of Agriculture	90,000.00
90 acres of land for the College of Agriculture	45,000.00
Equipment for chemistry, physics, School of Mines, Civil Engineering and Architecture	54,500.00
Total appropriation	$1,016,500.00
To which should be added the other revenues of the university	242,000.00
Grand total	$1,258,500.00

THE INSTALLATION OF PRESIDENT HOUSTON.

The public exercises attendant upon the inauguration of Dr. David Franklin Houston as president of the University of Texas will take place at the Main University, Austin, on April 18–19, 1906. Advantage has been taken of this occasion to hold three meetings for the consideration of educational questions: (1) A meeting of the affiliated schools superintendents and principals for the discussion of advanced entrance requirements, the high school curriculum, character training and similar questions. (2) A meeting of county school superintendents for the discussion of matters appertaining to rural schools. (3) A meeting of representatives of Texas colleges for an interchange of views regarding advanced entrance requirements, transfers and credits, the quality and amount of work to be required of students, and effective moral agents in colleges and universities. Formal installation exercises will be held on the morn-

ing of April 19. Addresses will be made by Hon. S. W. T. Lanham, governor of Texas; Hon. R. B. Cousins, state superintendent of public instruction; Hon. T. T. Connally, of Marlin, representing the alumni; Dr. George P. Garrison, professor of history, representing the faculty; Hon. T. S. Henderson, representing the board of regents, a representative of the student body; President Benjamin Ide Wheeler, of the University of California; President George Edwin MacLean, of the State University of Iowa; and Chancellor James Hampton Kirkland, of Vanderbilt University, following which President Houston will deliver his inaugural address.

Dr. Houston is a graduate of South Carolina College and Harvard University. From 1894–1902 he filled the chair of political science in the university over which he has now been called to preside; from 1899–1902 he was dean of its faculty, and from 1902–1905 he was president of the Agricultural and Mechanical College of Texas.

THE AMERICAN PHILOSOPHICAL SOCIETY.

AT the general meeting of the American Philosophical Society, to be held in memory of the two-hundredth anniversary of the birth of Franklin in Philadelphia from April 17 to 20, the following program will be presented:

Tuesday evening, April 17, at Witherspoon Hall, Walnut Street, below Broad Street. The delegates, invited guests and members of the society are requested to meet in Westminster Hall, fourth floor, at 7:45 P.M.

Opening Session—8 P.M.

Address by the president, Edgar F. Smith; reception of delegates from learned societies and institutions of learning; presentation of addresses; an informal reception will be held in the assembly room, after adjournment.

Wednesday, April 18, in the Hall of the Society, on Independence Square (104 South Fifth Street).

Meetings for the reading of papers on subjects of science—10 A.M. and 2 P.M.

PROFESSOR WM. KEITH BROOKS, of Baltimore: 'Heredity and Variation, Logical and Biological.'

PROFESSOR THOMAS C. CHAMBERLIN, of Chicago: 'On a possible Reversal of the Deep Sea Circulation and its Effect on Geological Climates.'

FRANK WIGGLESWORTH CLARKE, Sc.D., of Washington: 'The Statistical Method in Chemical Geology.'

SIR GEORGE DARWIN, K.C.B., F.R.S., of Cambridge, England: 'The Figure and Stability of a Liquid Satellite.' (With lantern slides of diagrams.)

PROFESSOR WILLIAM MORRIS DAVIS, of Cambridge, Mass: 'Was Lewis Evans or Benjamin Franklin the first to recognize that the Northeast Storms come from the Southwest?

PROFESSOR FRANCIS BARTON GUMMERE, of Haverford, Pa.: 'Repetition and Variation in Poetic Structure.'

PROFESSOR PAUL HAUPT, of Baltimore, Md.: 'The Herodotean Prototype of Esther and Sheherazade.'

PRESIDENT DAVID STARR JORDAN, of Stanford University, Cal.: (Title to be announced later.)

PROFESSOR ALBERT A. MICHELSON, of Chicago: (Title to be announced.)

PROFESSOR EDWARD C. PICKERING, of Cambridge, Mass.: 'An International Southern Observatory.'

PROFESSOR JOSIAH ROYCE, of Cambridge, Mass.: 'The Present Position of the Problem concerning the First Principles of Scientific Theory.'

PROFESSOR WILLIAM B. SCOTT, of Princeton: 'Notes on a Collection of Fossil Mammals from Natal.'

PROFESSOR HUGO DE VRIES, of Amsterdam, Holland: Elementary Species in Agriculture.'

Executive Session—12:30 P.M.

Luncheon will be served in the hall at one o'clock.

Evening Session—8 P.M., at Witherspoon Hall, Walnut Street below Broad Street.

ADDRESSES.

PROFESSOR EDWARD L. NICHOLS, Ph.D., of Ithaca: 'Franklin's Researches in Electricity.'

PROFESSOR ERNEST RUTHERFORD, F.R.S., of Montreal: 'The Modern Theories of Electricity and their Relation to the Franklinian Theory.'

Thursday, April 19, at the American Academy of Music, Broad and Locust Streets, 11 A.M.

Conferring of honorary degrees by the University of Pennsylvania.

Oration by the HON. HAMPTON L. CARSON, Attorney General of the Commonwealth of Pennsylvania.

At Christ Church Burying Ground, Fifth and Arch Streets, 3 P.M.

Ceremonies at the grave of Franklin under the auspices of the Grand Lodge of F. & A. M., of Pennsylvania. The delegates and members will assemble in the hall of the society, on Independence Square, at 2:30 o'clock and proceed to the grave of Franklin.

At the Bellevue-Stratford, Broad and Walnut Streets, 9 P.M. Reception.

Friday, April 20, at the American Academy of Music, Broad and Locust Streets, 11 A.M. The delegates, invited guests and members will meet in the foyer of the academy at 10:45 A.M.

Addresses in Commemoration of Benjamin Franklin.

HORACE HOWARD FURNESS, D.Litt. (Cantab.): 'As Citizen and Philanthropist.'

CHARLES WILLIAM ELIOT, LL.D.: 'As Printer and Philosopher.'

JOSEPH HODGES CHOATE, LL.D., D.C.L.: 'As Statesman and Diplomatist.'

Presentation of the Franklin Medal to the Republic of France (in accordance with the Act of Congress), by the HONORABLE ELIHU ROOT, secretary of state (by direction of the President).

7 P.M., dinner at the Bellevue-Stratford.

SCIENTIFIC NOTES AND NEWS.

THE National Academy of Sciences will hold its annual meeting at Washington, beginning on April 16.

DR. A. GRAHAM BELL has sailed for England; he will return in time to attend the meeting of the regents of the Smithsonian Institution on May 10.

PROFESSOR IRA N. HOLLIS has been appointed delegate of Harvard University at the fiftieth anniversary meeting of the Society of German Engineers, to be held at Berlin from June 11 to 14, 1906.

PROFESSOR EUGEN KÜHNEMANN, of the University of Bonn and at the same time rector of the Royal Academy organized at Posen in 1903, will lecture at Harvard University next year, representing Germany in the interchange of professors between Harvard University and the German government. Professor Kühnemann is known for his contributions to philosophy and literature.

THE students of Edinburgh University propose to honor Sir William Turner, principal of the university and formerly professor of anatomy, on the occasion of his having completed fifty years of active official academic connection with the university.

DR. C. J. KEYSER, Adrain professor of mathematics at Columbia University, has been elected a member of the Circolo Matematico di Palermo.

DR. G. A. SCHWALBE, professor of anatomy at Strasburg, has been elected a foreign member of the Swedish Academy of Sciences.

DR. A. HEIM, professor of geology at Zurich, has been elected a corresponding member of the Paris Academy of Sciences.

THE council of the Anthropological Institute of Great Britain and Ireland has appointed Professor F. W. Putnam, as its senior honorary fellow in America, to represent the institute at the meeting of the American Philosophical Society which is to be held next week in celebration of the bi-centenary of Benjamin Franklin. Dr. George Grant MacCurdy, of Yale University, will represent the Paris School of Anthropology and the Paris Society of Anthropology on the same occasion.

DR. HERMANN M. BIGGS, medical officer of the Board of Health of New York City, is to leave shortly to make a three months' official tour of inspection of the European hospitals and water filtration plants.

DR. DUNCAN S. JOHNSON, of the Johns Hopkins University, sailed for Jamaica on April 5 to spend two months at the Cinchona station of the New York Botanical Garden. He will be joined there by Messrs. W. D. Hoyt and I. F. Lewis, students at Johns Hopkins University. Dr. Forrest Shreve, Bruce fellow of the same institution, is spending the year at Cinchona in work on the physiology and ecology of the forest of the Blue Mountains.

PROFESSOR J. B. WOODWORTH, of Harvard University, will conduct a geological excursion to Yorktown, Va., during the April recess. The principal object of the expedition is to secure a collection of Miocene fossils.

A REUTER telegram states that M. Mylius Erichsen's Danish expedition to the northeast coast of Greenland will leave Copenhagen at the end of June, and will proceed *viâ* the Færöe Islands and east Iceland to the east Greenland pack-ice, through which the explorer expects to be able to penetrate into east Greenland between 57° and 77° northern lat. In addition to the Danish members, the exploring party will probably include Dr. A. Wegener, from Germany, as physicist and meteorologist, and Dr. Baron Firchs, from Russia, as geologist.

THE sum of $23,000 has been subscribed for the Finsen memorial. The committee reports that $9,500 will be used for a special memorial, and the balance will be devoted to enlarging the Finsen Light Institute.

DR. NATHANIAL SOUTHGATE SHALER, professor of geology at Harvard University and dean of the Lawrence Scientific School, died on April 10, aged sixty-five years.

WE regret to record the death, at the age of seventy-one years, of Dr. Weston Flint, formerly librarian of the Public Library, Washington, D. C., and secretary of the Anthropological Society of Washington.

PROFESSOR LIONEL S. BEALE, F.R.S., emeritus professor of medicine at King's College, London, well known for his publications on the microscope, died on March 28, at the age of seventy-eight years.

PROFESSOR ADOLF EMMERLING, docent for agricultural chemistry at Kiel, died on March 17, at the age of sixty-four years.

THERE will be on April 4 and 5 a civil service examination to fill vacancies in the positions of assistant geologist and geologic aid in the Geological Survey, at salaries ranging from $1,000 to $1,600 per annum.

THE advisory board of anatomists of the Wistar Institute, Philadelphia, will hold its annual meeting on April 16 to 18.

ACCORDING to a despatch received at the office of the department of terrestrial magnetism of the Carnegie Institution of Washington, the Yacht *Galilee* engaged in the magnetic survey of the Pacific Ocean arrived safely at Fanning Island on March 31, having accomplished the trip of 3,500 miles from San Diego in 29 days, besides executing successfully magnetic work along the entire cruise.

GOVERNOR HIGGINS, of New York, has recommended the creation of a commission to make arrangements for the celebration of the three-hundredth anniversary of the discovery of the Hudson River and the centenary of the use of steam in navigation on the river.

LORD RAYLEIGH presided at the annual meeting of the general board of the National Physical Laboratory on March 16. According to the abstract in the London *Times* the report of the executive committee showed progress in all directions. Some 14 scientific papers of importance have been published officially, while members of the staff have contributed nine others to various journals. The second volume of 'Collected Papers' is in course of preparation. The scheme of work for 1906 includes a research into the resistance of materials of construction to impact, the continuation of the wind pressure and steam researches, the completion of the work with the Ampere balance, and some experiments of great interest on the effect of the continued application of high pressure to insulators. In the metallurgical division a research into the properties of aluminium bronze promises interesting results. The report announced the intention of the government, communicated to the Royal Society in December last, to grant a sum of £5,000 for buildings during the year and the increase of the annual grant by £500. It referred also to the very successful meeting in the House of Commons last August, under the chairmanship of Mr. Haldane, which led up to a petition, signed by 150 members of the house, asking that the grants should be increased, and the chairman was able to an-

nounce that the chancellor of the exchequer had recently intimated his intention of making the building grant for the year £10,000, instead of £5,000 as originally contemplated. It was also stated that the Goldsmiths' Company had made a donation of £1,000 with the request that it should be devoted to some specific object.

Minister Wilson, of Brussels, transmits a Belgian invitation for American scientific men and geographical societies to participate in the proposed formation of an international association for the exploration of the polar regions. Among the inclosures from the minister is a circular letter from Mr. G. Lecointe, scientific director of the Royal Observatory of Belgium, who furnishes a report of a special committee of the Congress of Mons relative to the study of the polar regions. This committee was appointed during a session of the congress in September, 1905, under the auspices of His Majesty King Leopold II., and the presidency of Mr. Beernaert, minister of state, to formulate plans for the formation of an international polar-region association. The Belgian government is not as yet officially identified with the proposed association. The present purpose of the committee having the matter in charge, is simply to invite an exchange of views between scientific organizations, official or otherwise. The minister also incloses a pamphlet entitled 'Projet d'une exploration systématique des régions polaires,' by Henryk Arctowski, a member of the recent Belgian expedition to antarctic regions.

At the annual meeting of the Audubon Society of the state of New York, which was held at the American Museum of Natural History, New York City, on Friday, March 16, 1906, Mr. Frank M. Chapman presiding, the following resolutions were unanimously carried by the members present:

Whereas, The legislature of the state has by wise enactments provided that no game of any kind shall be sold during the closed season, and

Whereas, The court of appeals has unanimously pronounced such legislation necessary in order to protect the native game of the state, and

Whereas, The said court of appeals has also unanimously pronounced such legislation constitutional, therefore be it

Resolved, That the Audubon Society of the state of New York protests most emphatically against the passage of any bill to modify or change the present law or that will permit any corporation or persons to sell foreign game in this state during the closed season, and

Resolved, That the Audubon Society is opposed to any special legislation for the benefit of a few persons at the expense of and against the interest of the majority of the citizens of the state, and

Resolved, That copies of these resolutions be sent by the secretary to the Forest, Fish and Game Commission, the members of the legislature and to the press of the state.

UNIVERSITY AND EDUCATIONAL NEWS.

Adelbert College, Western Reserve University, has received $150,000 from the grandchildren of Joseph Perkins, formerly a trustee of the college. The money is to be used for a department of sociology and a chemical laboratory.

Plans have been completed for the construction of the new buildings for the mining department of the University of Idaho at Moscow. It is estimated that the two buildings will cost $40,000, exclusive of apparatus. The appropriation was made by the last Idaho legislature for this purpose. The metallurgical building, 96 x 68 feet, will contain ten ore bins, giving a total capacity of fifty tons. The ore will be conveyed by automatic apparatus to the crushing and sampling departments.

In August, 1908, the University of Jena will celebrate the three hundred and fiftieth anniversary of its foundation.

Dr. Edw. Anthony Spitzka, fellow and demonstrator of anatomy, College of Physicians and Surgeons (Columbia), has been elected professor of general anatomy at Jefferson Medical College, Philadelphia.

Dr. Hugh M'Lean, senior assistant in physiology, has been appointed lecturer in chemical physiology, in Aberdeen University.